Asthma Diagnosis and Preventive Management in Children
Originally Approved: March 2014
Last Updated: March 2014
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Guidelines Reviewed:
1. NHLBI 2007 Expert Panel Report (EPR) 3: Guidelines for the Diagnosis and Management of Asthma
2. Asthma Diagnosis and Treatment Guideline, Group Health Cooperative, copyright 1999-2012
3. Key Points for Asthma Guideline Implementation, Medical Home Chapter Champions Program on Asthma, National Center for Medical Home Implementation, American Academy of Pediatrics, Spring 2013

Objective: To correctly identify children with asthma early, and begin management that allows full activity and prevents severe exacerbations.

Specific objectives:
1. To use consistent criteria for diagnosing children with asthma
2. To manage asthma symptoms with the most effective and least harmful treatments by using an evidence-based pathway
3. To include spirometry data with and without a bronchodilator in the diagnostic evaluation and periodic reassessments in children who can perform the test.

Brief Summary of Recommendations:
1. Determine which children who have had an acute wheezing event meet criteria for persistent asthma.
2. Classify asthma severity. Severity combines impairment, which includes symptom history, physical exam and lung function testing by spirometry (in those children able to perform the test), and risk, or likelihood of more exacerbations based on previous exacerbations.
3. Start appropriate asthma management using evidence-based therapies and preventive measures. The asthma severity at presentation should guide the initial choice of therapy.

Components of Management:
1. Measurement (history and exam, objective tests)
2. Education
3. Identification and reduction of exposure to environmental triggers
4. Identification and management of comorbid conditions (obesity, GERD, sleep apnea)
5. Pharmacological control
6. Written Asthma Action Plan
7. Periodic monitoring
Inclusion criteria:
- Cough, wheeze or difficulty breathing

Exclusion criteria:
- Other disorders that could cause or complicate wheezing, such as infection, other lung disease, airway anomaly, heart failure, foreign body aspiration

First, assess symptom severity
- If child is in respiratory distress, move to the Asthma Acute Care Pathway.
- Return to this diagnostic and preventive management pathway when the child is returning for follow up.

Children age 4 or less:
1. Diagnose asthma
   a. Episodic airflow obstruction that can be reversed with bronchodilators and/or steroids and is not caused by other disorders.
      i. Symptoms of episodic airflow obstruction include cough, wheeze or shortness of breath that is worse at night or with exercise, or when exposed to viral infections or common allergens like animals, dust mites, or pollen, or cold air.
      ii. Failure to thrive or continuous wheezing or asymmetrical lung sounds suggest the need to look for another diagnosis and consider referral.
   b. Risk of another exacerbation
      i. ≥ 2 episodes in the past 12 months requiring oral steroids, OR
      ii. ≥ 4 episodes of cough or wheeze in the past year

2. Classify severity (intermittent vs. persistent asthma) using both ongoing impairment and the risk of future exacerbations (Table 1, from EPR 2007, p. 72)
   a. Intermittent - children who have above symptoms but who do not meet criteria for persistent asthma
   b. Persistent - use Table 1 to further classify as mild, moderate or severe
      i. Ongoing impairment
         a. Symptoms or need for SABA ≥2 days a week for the past 4 weeks
         b. Night awakenings ≥2 nights a month, or
         c. Any limitation of their normal activity due to cough, wheeze or shortness of breath, OR
      ii. Likelihood of future exacerbations based on the asthma predictive index:

<table>
<thead>
<tr>
<th>Major risk factors (need 1)</th>
<th>Minor risk factors (need 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Parental history of asthma</td>
<td>• Sensitization to foods</td>
</tr>
<tr>
<td>• Atopic dermatitis diagnosed by a physician</td>
<td>• ≥ 4% eosinophils on CBC</td>
</tr>
</tbody>
</table>
3. **Treatment.** (Table 2, from EPR-2007, p. 305)
   a. **Intermittent asthma**
      i. SABA 2-4 puffs every four hours when needed
   b. **Persistent asthma**
      i. low-dose inhaled corticosteroids
      ii. SABA as needed
   c. **Moderate to severe persistent asthma**
      i. medium-dose inhaled corticosteroids or low-dose inhaled corticosteroids plus another agent; either a long-acting bronchodilator or a leukotriene receptor antagonist (LTRA, such as montelukast)
      ii. SABA as needed
      iii. Refer for allergy and pulmonary specialty consultations.
   d. **At all levels**
      1. Educate the family about signs, symptoms and management
      2. Look for possible triggers and comorbidities
      3. Develop an asthma action plan and give the family a written copy
      4. Develop a tracking system for education topics, reminder calls for follow up, and for emergency room visits

4. **Follow up**
   a. One to four times a year, depending on level of control
   b. Assess level of control (Table 3, from EPR-2007, p.75)
   c. Adjust therapy
   d. Continue other components of management and tracking
Table 1

**Figure 3–4a. Classifying Asthma Severity in Children 0–4 Years of Age**

- **Classifying severity in children who are not currently taking long-term control medication.**

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity (Children 0–4 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
</tr>
<tr>
<td>Impairment</td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>&lt;2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>0</td>
</tr>
<tr>
<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>&lt;2 days/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td>Risk</td>
<td></td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0-1/year</td>
</tr>
</tbody>
</table>

- Level of severity is determined by both impairment and risk. Assess impairment domain by caregiver’s recall of previous 2–4 weeks. Assign severity to the most severe category in which any feature occurs.

- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral corticosteroids in the past 6 months, or ≥4 wheezing episodes in the past year, and who have risk factors for persistent asthma may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

**Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control.***

<table>
<thead>
<tr>
<th>Lowest level of treatment required to maintain control (See figure 4–1a for treatment steps.)</th>
<th>Classification of Asthma Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent</td>
<td>Persistent</td>
</tr>
<tr>
<td>Step 1</td>
<td>Mild</td>
</tr>
<tr>
<td>Step 2</td>
<td>Moderate</td>
</tr>
<tr>
<td>Step 3 or 4</td>
<td>Severe</td>
</tr>
<tr>
<td>Step 5 or 6</td>
<td></td>
</tr>
</tbody>
</table>

Key: EIB, exercise-induced bronchospasm

*Notes:

- For population-based evaluations, clinical research, or characterization of a patient’s overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control (See figure 3–5a.), not the level of severity, once treatment is established.
- See figure 3–5a for definition of asthma control.
**Table 2**

**Figure 4-1a. Stepwise Approach for Managing Asthma in Children 0-4 Years of Age**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred: Low-dose ICS</td>
<td>Preferred: Medium-dose ICS</td>
<td>Preferred: Medium-dose ICS + either LABA or Montelukast</td>
<td>Preferred: High-dose ICS + either LABA or Montelukast</td>
<td>Preferred: High-dose ICS + either LABA or Montelukast</td>
<td>Step up if needed</td>
</tr>
<tr>
<td>Alternative: Cromolyn or Montelukast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(first, check adherence, inhaler technique, and environmental control)</td>
</tr>
</tbody>
</table>

**Patient Education and Environmental Control at Each Step**

- Quick-Relief Medication for All Patients
  - SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms.
  - With viral respiratory infection: SABA q 4-6 hours up to 24 hours (longer with physician consult). Consider short course of oral systemic corticosteroids if exacerbation is severe or patient has history of previous severe exacerbations.
  - Caution: Frequent use of SABA may indicate the need to step up treatment. See text for recommendations on initiating daily long-term control therapy.

**Key:** Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy. ICS, inhaled corticosteroid; LABA, inhaled long-acting beta-agonist; SABA, inhaled short-acting beta-agonist

**Notes:**
- The stepwise approach is meant to assist, not replace, the clinical decision-making required to meet individual patient needs.
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stopping up.
- If clear benefit is not observed within 4-6 weeks and patient/family medication technique and adherence are satisfactory, consider adjusting therapy or alternative diagnosis.
- Studies on children 0-4 years of age are limited. Step 2 preferred therapy is based on Evidence A. All other recommendations are based on expert opinion and extrapolation from studies in older children.
## Figure 3–5a. Assessing Asthma Control in Children 0–4 Years of Age

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Classification of Asthma Control (Children 0–4 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well Controlled</td>
</tr>
<tr>
<td>Impairment</td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≥1x/month</td>
</tr>
<tr>
<td>Interference with</td>
<td>None</td>
</tr>
<tr>
<td>normal activity</td>
<td></td>
</tr>
<tr>
<td>Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Risk</td>
<td></td>
</tr>
<tr>
<td>Exacerbations</td>
<td>0–1/year</td>
</tr>
<tr>
<td>requiring oral systemic corticosteroids</td>
<td></td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td>Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.</td>
</tr>
</tbody>
</table>

Key: EIB, exercise-induced bronchospasm; ICU, intensive care unit

### Notes:
- The level of control is based on the most severe impairment or risk category. Assess impairment domain by caregiver’s recall of previous 2–4 weeks. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient’s asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with persistent asthma.
Children 5 and up

1. **Diagnose asthma**
   a. Evidence of airflow obstruction such as cough, wheeze or shortness of breath as above, especially if worse at night or with exertion
   b. Improvement with short-acting bronchodilator (SABA), e.g. albuterol
   c. Evidence of reversible airway obstruction on spirometry (when able to perform)
      i. If any obstruction on spirometry, retest after 2 puffs of short-acting bronchodilator (SABA). An improvement in FEV1 of $>12\%$ is considered to be a reversible obstruction.
      ii. Refer children for pulmonology consultation who have a restrictive pattern on spirometry or an obstructive pattern that does not respond to bronchodilators.
   d. Exclude other causes of chronic or recurrent cough, wheeze or respiratory distress with history and physical exam.

2. **Classify severity** using Tables 4 and 5, from EPR-2007
   a. **Intermittent:**
      i. Symptoms and inhaler use less than the criteria for persistent asthma
      ii. Normal or mild obstruction on spirometry
      iii. 0-1 exacerbations/year that require oral steroids
   b. **Persistent:**
      i. Symptoms or inhaler use more than twice a week
      ii. Night awakening more than twice a month
      iii. Impaired activity level
      iv. Abnormal lung function on spirometry
      v. 2 or more exacerbations/year requiring oral steroids
      vi. Further classify into mild, moderate or severe using EPR-2007 tables.
      vii. Assign the patient to a level based on whichever symptom or lung function is the most severely impaired.

3. **Initial treatment:** use tables from Asthma Initial Management diagram
   a. **Intermittent**: Step 1
      i. Short-acting bronchodilator (SABA) given as needed
      ii. Some children with intermittent asthma may have infrequent but severe exacerbations requiring oral steroids or ER or hospital admission. These children should have written asthma action plans and possibly oral steroid medication at home like children with more persistent asthma.
   b. **Mild Persistent**: Step 2
      i. low-dose inhaled corticosteroids
      ii. SABA as needed
   c. **Moderate to Severe Persistent**: start with Step 2 or Step 3
      i. medium-dose inhaled corticosteroids
ii. Other options: lower dose of steroids plus long-acting bronchodilator or leukotriene modifier

iii. SABA as needed

iv. Refer to a pulmonologist or asthma specialist requiring Step 4 on the table or higher to achieve control. Consider referral for Step 3.

4. At all levels
   a. Determine triggers, minimize exposure
   b. Identify comorbid conditions
   c. Provide education, including a written Asthma Management Plan
   d. Track education, referrals, emergency visits and follow up

5. Follow up: see tables on diagram
   a. Assess level of control by symptoms and lung function on spirometry, and family's understanding of and compliance with recommended treatment.
   b. Use validated questionnaires to assess symptoms whenever possible.
   c. Adjust treatment Step as needed to achieve good control and minimize side effects.
   d. Frequency of follow-up
      i. **Well controlled**: 1-4 times per year, depending on initial severity and treatment Step.
      ii. **Not well controlled**: 2-6 weeks after moving to the next Step, until good control is achieved.
      iii. **Very poorly controlled**: 2 weeks after a course of oral steroids and moving up 1-2 Steps, until good control is achieved. Inhaled corticosteroids may take up to 6 weeks for full efficacy, so dose increases should allow time to assess the response.
Table 4

**FIGURE 3–4b. CLASSIFYING ASTHMA SEVERITY IN CHILDREN 5–11 YEARS OF AGE**

- Classifying severity in children who are not currently taking long-term control medication.

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity (Children 5–11 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
</tr>
<tr>
<td></td>
<td>Mild</td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2x/month</td>
</tr>
<tr>
<td>Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
</tbody>
</table>

- Lung function
  - Normal FEV₁ between exacerbations
  - FEV₁ >80% predicted
  - FEV₁/FVC >85%
  - FEV₁ = >80% predicted
  - FEV₁/FVC >80%
  - FEV₁ = 50–80% predicted
  - FEV₁/FVC = 75–80%
  - FEV₁ <60% predicted
  - FEV₁/FVC <75%

- Risk
  - Exacerbations requiring oral systemic corticosteroids
    - 0–1/year (see note)
    - ≥2 in 1 year (see note)
    - Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category
    - Relative annual risk of exacerbations may be related to FEV₁

- Level of severity is determined by both impairment and risk. Assess impairment domain by patient’s/caregiver’s recall of the previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.

- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

- Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control.*

<table>
<thead>
<tr>
<th>Lowest level of treatment required to maintain control (See figure 4–1b for treatment steps.)</th>
<th>Classification of Asthma Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
</tr>
<tr>
<td></td>
<td>Mild</td>
</tr>
<tr>
<td>Step 1</td>
<td>Step 2</td>
</tr>
</tbody>
</table>

Key: EIB, exercise-induced bronchospasm; FEV₁, forced expiratory volume in second; FVC, forced vital capacity; ICU, intensive care unit

*Notes:
- For population-based evaluations, clinical research, or characterization of a patient’s overall asthma severity after control is achieved.
- For clinical management, the focus is on monitoring the level of control (See figure 3–5b.), not the level of severity, once treatment is established.
- See figure 3–5b for definition of asthma control.
**Table 5**

**Figure 3-4c. Classifying Asthma Severity in Youths ≥12 Years of Age and Adults**

- Classifying severity for patients who are not currently taking long-term control medications.

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity (Youths ≥12 years of age and adults)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
</tr>
<tr>
<td>Symptoms</td>
<td>&lt;2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2x/month</td>
</tr>
<tr>
<td>Impairment</td>
<td></td>
</tr>
<tr>
<td>Normal FEV1/FVC</td>
<td>&lt;2 days/week</td>
</tr>
<tr>
<td>Short-acting beta2-agonist for symptom control (not prevention of EIB)</td>
<td>≤2x/month</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td>Lung function</td>
<td>Normal FEV1 between exacerbations</td>
</tr>
<tr>
<td>Risk</td>
<td>Exacerbations requiring oral systemic corticosteroids</td>
</tr>
<tr>
<td></td>
<td>Relative annual risk of exacerbations may be related to FEV1,</td>
</tr>
</tbody>
</table>

- Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient’s/caregiver’s recall of previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.

- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had 22 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

- Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control.*

<table>
<thead>
<tr>
<th>Lowest level of treatment required to maintain control (See figure 4-5 for treatment steps.)</th>
<th>Classification of Asthma Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
</tr>
<tr>
<td>Step 1</td>
<td>Mild</td>
</tr>
<tr>
<td>Step 2</td>
<td>Step 3 or 4</td>
</tr>
</tbody>
</table>

Key: EIB, exercise-induced bronchospasm; FEV1, forced expiratory volume in 1 second; FVC, forced vital capacity; ICU, intensive care unit.

*Notes:

- For population-based evaluations, clinical research, or characterization of a patient’s overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control (See figure 3-5c), not the level of severity, once treatment is established.

- See figure 3–5c for definition of asthma control.