MAKING ASTHMA DIAGNOSIS

David S. Gourley, MD FAAAAI
Adjunct Associate Professor of Pediatrics
University of Utah
Objectives:

- History and patterns of symptoms
- Measurements of lung function
  - Spirometry
  - Peak expiratory flow
- Measurement of airway responsiveness
- Measurements of allergic status to identify risk factors
- Extra measures may be required to diagnose asthma in children 5 years and younger and the elderly
Clinical Diagnosis

- Symptoms: cough, episodic breathlessness, wheezing and chest tightness
- Seasonal variability of symptoms
- Positive family history of asthma and atopic disease
Key Questions to Ask?

- Does the patient have recurrent attacks of wheezing?
- Does the patient have a troublesome cough at night?
- Does the patient cough or wheeze after exercise?
- Does the patient have cough, chest tightness or wheeze after exposure to allergens or pollution?
- Does the patient have colds that go “straight to the chest” and last for >10 days?
- Are symptoms improved by appropriate antiasthma medications?
ASTHMA TRIGGERS
Presence of any of these signs and symptoms should increase the suspicion of asthma:

- Wheezing—high-pitched whistling sounds when breathing out—especially in children. (A normal chest examination does not exclude asthma.)
- History of any of the following: • Cough, worse particularly at night • Recurrent wheeze • Recurrent difficult breathing • Recurrent chest tightness
- Symptoms occur or worsen at night, awakening the patient.
Is it Asthma?

- > 50% of children have wheezing episodes in the first five years of life and don’t go on to develop asthma
- Exercise may be the only causative factor
- Cough may be the only symptom (Cough Variant Asthma)
Physical Examination

- May be normal
- The most usual abnormal physical finding is wheezing on auscultation
- However, some people with asthma may have normal auscultation but significant airflow limitation when measured objectively
Dyspnea, airflow limitation (wheeze), and hyperinflation are more likely to be present if patients are examined during symptomatic periods.

Physical signs reflecting severity: cyanosis, drowsiness, difficulty speaking, tachycardia, hyperinflated chest, use of accessory muscles, and intercostal retractions.
Childhood Asthma Diagnosis

- Asthma can often be diagnosed on the basis of symptoms.
- However, measurements of lung function, and particularly the reversibility of lung function abnormalities, greatly enhance diagnostic confidence in children years and older.
Spirometry is the preferred method of measuring airflow limitation and its reversibility to establish a diagnosis of asthma.

- An increase in FEV1 of $\geq 12\%$ (or $\geq 200 \text{ ml}$) after administration of a bronchodilator indicates reversible airflow limitation consistent with asthma.
Measurements of Lung Function

- Forced expiratory volume in 1 second (FEV1)
- Forced vital capacity (FVC)
- Peak expiratory flow (PEF)
- Midflows (FEF 25–75%)
FEV1 and the FEV1/FVC ratio

- FEV1/FVC ratios of < 80 percent, are suggestive of airflow limitation
- Where at least a 12 percent (or >200 ml) improvement in FEV1 either spontaneously, after inhalation of a bronchodilator, or in response to a trial of glucocorticosteroid therapy favors a diagnosis of asthma
Peak Expiratory Flow (PEF) Meters

Allows the patient to assess the status of his or her asthma
An important aid in the diagnosis and subsequent treatment of asthma is the PEF meter. At least a 15 percent improvement after inhalation of a bronchodilator or in response to a trial of glucocorticosteroid therapy favors a diagnosis of asthma. A diurnal variation in PEF of more than 20 percent is considered to be diagnostic of asthma.
Figure 1-6. Characteristic PEF Chart of a Patient With Uncontrolled Asthma Showing Within- and Between-Day Variation and the Response of a Reduced Morning PEF to a Bronchodilator (bd)

Printed with permission from Dr. Stephen T. Holgate.
Diagnostic considerations in children:

- The presence of recurrent nocturnal cough in an otherwise healthy child should raise asthma as a probable diagnosis.
- A trial of asthma medication is probably the most confident way to make a diagnosis of asthma in children.
- The use of diary cards to record symptoms and PEF (in children over years of age) readings are important tools in childhood asthma management.
Some children with asthma present symptom with exercise. If there is doubt in the diagnosis, a 10-minute running protocol followed by measurement of PEF showing a percent drop or symptoms following exercise can help establish a diagnosis of asthma.

Allergy skin tests, can help in the identification of risk factors.

Asthma should be considered if the child's colds repeatedly "go to the chest" or take more than 5 days to clear up, or if the child improves when asthma medication is given.
Is it Asthma?

- Symptoms occur or worsen in a seasonal pattern.
- The patient also has eczema, hay fever, or a family history of asthma or atopic diseases.
- Symptoms occur or worsen in the presence of: • Animals with fur • Aerosol chemicals • Changes in temperature • Domestic dust mites • Drugs (aspirin, beta blockers) • Exercise • Pollen • Respiratory (viral) infections • Smoke • Strong emotional expression
- Symptoms respond to anti-asthma therapy.
- Patient’s colds “go to the chest” or take more than 10 days to clear up.
Causes of recurrent wheezing in children
- cystic fibrosis, recurrent milk aspiration, primary ciliary dyskinesia syndrome, primary immune deficiency, congenital heart disease, congenital malformations causing narrowing of intrathoracic airways and foreign body aspiration.
- Chest radiography is an important diagnostic test to exclude such alternative causes of wheezing.
Natural History of Asthma: Childhood

- The predominant feature associated with asthma in children is allergy.
- It has often been suggested that childhood asthma will “disappear” when the patient reaches adulthood.
- It actually becomes “dormant” in 30 to 50 percent of children at puberty, but often reappears in adult life.
- The prognosis of asthma appears to be worse when the child has eczema or a family history of eczema.
- 5 to 10 percent of children with asthma that is considered to be trivial have severe asthma in later life.
STEP MANAGEMENT

Regularly assess:
Control
Triggers
Compliance
Inhaler technique
Co-morbidity

Modify maintenance therapy
Add-on therapy
Inhaled corticosteroids
Pred.

Fast-acting bronchodilator on demand
Environmental control
Education, written action plan, and follow-up

Very mild Mild Moderate Moderately severe Severe
STEP MANAGEMENT

TREATMENT STEPS

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma education</td>
<td></td>
<td>Environmental control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As needed rapid-acting β2-agonist</td>
<td>As needed rapid-acting β2-agonist</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CONTROLLER OPTIONS

<table>
<thead>
<tr>
<th>Controller Options</th>
<th>Select one</th>
<th>Select one</th>
<th>Add one or more</th>
<th>Add one or both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-dose ICS*</td>
<td>Low-dose ICS plus long-acting β2-agonist</td>
<td>Medium- or high-dose ICS plus long-acting β2-agonist</td>
<td>Oral glucocorticosteroid (lowest dose)</td>
<td>Anti-IgE treatment</td>
</tr>
<tr>
<td>Leukotriene modifier**</td>
<td>Medium- or high-dose ICS</td>
<td>Leukotriene modifier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-dose ICS plus leukotriene modifier</td>
<td>Sustained-release theophylline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-dose ICS plus sustained-release theophylline</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Inhaled glucocorticosteroids
** Receptor antagonist or synthesis inhibitors

(Reproduced from GINA Guidelines 2008.)
ASTHMA CLASSIFICATION

• SEVERITY
  – INTERMITTANT OR PERSISTANT
  – RULE OF 2’S
    • USING INHALER MORE THAN X2 PER WEEK
    • NIGHT TIME WAKENING MORE THAN X2 PER MONTH
    • REFILL ALBUTEROL CANISTER MORE THAN X2 PER YEAR

• CONTROL
  – CONTROLLED
  – PARTLY CONTROLLED
  – UNCONTROLLED
A 12-year-old girl is brought to the school infirmary because of shortness of breath. She was playing soccer earlier today, a cold October morning, and developed wheezing and shortness of breath. Her coach said that she had been gasping for air and for a brief while could not speak at all. She used her albuterol inhaler, taking four puffs in rapid succession, and now is beginning to feel better. She reports that in general she rarely needs her albuterol. She last used it sometime in the spring. She never wakes from her sleep due to asthma and has never had a severe attack requiring emergency department treatment or hospitalization. After she has sat in the office for a while, you check her peak flow. It is 350 L/min, a normal value for a girl of her height.
CASE 2

A mother brings her 6-year-old son to you for treatment of his asthma. She is clearly frustrated. He has missed school 10 days in the last 3 months because of his asthma. Nearly every night over the last several months, he has been waking with cough and sounds of chest congestion. Although normally active during the day, he prefers to play inside. She has given him cough drops, Robitussin cough syrup, and warm tea with milk to help control his symptoms. At night she will sometimes take him into the bathroom and turn on the shower with very hot water to create a warm mist for him to breathe. On your inspection, he appears to be a healthy young boy. His height and weight are normal for his age. His chest examination reveals bilateral musical wheezes on exhalation. The remainder of his examination is normal.
A 14-year-old male with known asthma for 10 years is seen in your office for a follow-up of his asthma. He states his asthma has been in good control on his low dose of inhaled corticosteroid. But when asked about albuterol use, he says he uses it 2-3 times daily. When asked about nighttime awakening due to asthma, he states he awakes because of asthma 3 times per month. He also tells you that he has not missed a day of school. A PFT indicates he has an FEV1 of 81% predicted.
CASE 4

A 12-year-old student presents to you complaining of a severe head cold. In speaking with her about her symptoms, it comes out that she has asthma. She reports that she has never had a severe attack of asthma and manages with intermittent use of her bronchodilator inhaler. She uses it whenever she develops shortness of breath or tightness in her chest, generally 3 to 4 times per week. At night she always makes sure that her inhaler is placed close at hand on her bedside table. If she wakes at night with cough or chest congestion—as she does approximately once every 1-2 weeks—she takes two inhalations from her inhaler and generally can fall back to sleep within 10-15 minutes. On examination, she is afebrile; her throat is mildly erythematous; and her chest is entirely clear to auscultation. You measure her peak expiratory flow; it is 400 L/min, a normal value of a girl of her age and height.
Case 5

A 6-year-old boy is referred by his pediatrician to you for asthma unresponsive to therapy with inhaled steroids and montelukast. He has had asthma symptoms since the age of 6 months and has been on multiple inhaled medications. His mother gives him a dose of nebulized albuterol every morning so that he can play during the day. The last time he had night symptoms was 2 months ago. He has been hospitalized with wheezing 4 times in the last 2 years, never intubated. He has been to the ER 3 times in the last year and was given prednisone during the last visit 1 month ago.
CASE 5

PAST MEDICAL HISTORY:
Asthma, allergic rhinitis. Skin prick testing positive for HDM, mold, grass, trees (2 years ago)

MEDICATIONS:
fluticasone/salmeterol 250/50 bid and montelukast daily

FAMILY HISTORY:
Father with asthma as a child

PHYSICAL EXAM:

WHAT IS YOUR DIAGNOSIS & TREATMENT PLAN?
REASONS TO SEE AN ASTHMA SPECIALIST

• FIND AND TREAT ASTHMA TRIGGERS

• EDUCATE FAMILY

• TREAT CO-MORBID CONDITIONS
  – RHINITIS AND SINUSITIS
  – GASTROESOPHAGEAL REFLUX

• DIFFICULTY ACHIEVING CONTROL
ACTION PLAN

My Asthma Action Plan

Patient Name: ____________________________
Medical Record #: _______________________

Physician’s Name: _________________________
Medical Record #: _______________________

Physician’s Phone #: _______________________

Completed by: ____________________________
Date: _________________________________

Long-Term-Control Medicines

<table>
<thead>
<tr>
<th>How Much To Take</th>
<th>How Often</th>
<th>Other Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Quick-Relief Medicines

<table>
<thead>
<tr>
<th>How Much To Take</th>
<th>How Often</th>
<th>Other Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Special instructions when I feel good, not good, and awful.

I feel good.
- (My peak flow is in the GREEN zone)
- My symptoms are back to normal.

PREVENT asthma symptoms everyday:
- Take my long-term-control medicines (alone) every day.
- Before exercise, take _______ puffs of ________.
- Avoid things that make my asthma worse like...

I do not feel good.
- (My peak flow is in the YELLOW zone)
- My symptoms may be one or more of the following:
  - Wheeze
  - Tight chest
  - Cough
  - Shortness of breath
  - Waking up at night with asthma symptoms
  - Decreased ability to do usual activities

CAUTION: I should continue taking my long-term-control asthma medicines every day AND...
- Take______
- If I still do not feel good, my peak flow is not back in the Green Zone within 1 hour, then I should...
  - Increase______
  - Add______
  - Call______

I feel awful.
- (My peak flow is in the RED zone)
- Warning signs may include one or more of the following:
  - It’s getting harder and harder to breathe.
  - Unable to sleep or do usual activities because of trouble breathing.

MEDICAL ALERT! Get help!
- Take ______ until I get help immediately.
- Call ______

Danger! Get help immediately!
Call 911 if you have trouble walking or talking due to shortness of breath or lips or fingernails are gray or blue.

© Copyright 2009 Elsevier Inc. All rights reserved. M. F. M. (2000) M. F. M. (2000)