Asthma: Classification, Management, Prevention and New Treatments

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• I have no relevant financial relationships to disclose
• I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.
Outline

- Definition
- Epidemiology
- Diagnosis
- Management
- New Therapies
- Prevention
Asthma

• Chronic inflammatory disorder of the airway which results in recurrent episodes of airflow obstruction that is often reversible
  – Symptoms
  – Airway obstruction
  – Inflammation
  – Hyperresponsiveness
Inflammation in Mild Asthma

Subject Without Asthma

Patient With Mild Asthma

Epidemiology

• 10% of children in the US: 7 million children under the age of 18
• Prevalence is increasing
• Asthma morbidity and mortality is increasing
• 50% have family history of asthma, rhinitis, eczematous dermatitis, or urticaria
<table>
<thead>
<tr>
<th>Characteristic **</th>
<th>Number with Current Asthma (in thousands)</th>
<th>Percent with Current Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>24,633</td>
<td>7.8%</td>
</tr>
<tr>
<td>Child (Age &lt;18)</td>
<td>6,188</td>
<td>8.4%</td>
</tr>
<tr>
<td>Adult (Age 18+)</td>
<td>18,445</td>
<td>7.6%</td>
</tr>
<tr>
<td><strong>All Age Groups</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4 years</td>
<td>935</td>
<td>4.7%</td>
</tr>
<tr>
<td>5-14 years</td>
<td>4,033</td>
<td>9.8%</td>
</tr>
<tr>
<td>15-19 years</td>
<td>2,107</td>
<td>10.2%</td>
</tr>
<tr>
<td>20-24 years</td>
<td>1,655</td>
<td>7.6%</td>
</tr>
<tr>
<td>25-34 years</td>
<td>2,916</td>
<td>6.8%</td>
</tr>
<tr>
<td>35-64 years</td>
<td>9,907</td>
<td>8.0%</td>
</tr>
<tr>
<td>65+ years</td>
<td>3,079</td>
<td>6.6%</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Number of persons with current asthma* who reported having one or more asthma attacks (in thousands)</td>
<td>Percent of persons with current asthma* who reported having one or more asthma attacks</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Total</td>
<td>11,533</td>
<td>46.9%</td>
</tr>
<tr>
<td>Child (Age &lt;18)</td>
<td>2,941</td>
<td>47.5%</td>
</tr>
<tr>
<td>Adult (Age 18+)</td>
<td>8,592</td>
<td>46.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number</th>
<th>Rate * per 10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>439,435</td>
<td>14.1</td>
</tr>
<tr>
<td>Child (Age &lt;18)</td>
<td>136,669</td>
<td>18.3**</td>
</tr>
<tr>
<td>Adult (Age 18+)</td>
<td>302,766</td>
<td>13.0**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race</th>
<th>Number</th>
<th>Rate * per 10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>220,528</td>
<td>8.7</td>
</tr>
<tr>
<td>Black</td>
<td>113,522</td>
<td>29.9</td>
</tr>
<tr>
<td>Other</td>
<td>27,312</td>
<td>12.6</td>
</tr>
</tbody>
</table>
Onset of Symptoms in Children With Asthma

- 20% 1-2 years
- 30% <1 year
- 20% 2-3 years
- 30% >3 years

Natural History of Childhood Asthma

Asthma Prevalence in US Children

Etiology

• Genetic predisposition – Atopy
  – Atopic component in 50% of patients
  – Associated with eczema, fever or urticaria.
  – Raised IgE, eosinophilia, labile PEFR, known sensitivity to allergens

• Infection
  – Viral-induced wheeze occurs in some 20% of children
  – RSV highly associated with subsequent wheeze
  – RV highly associated with persistent wheeze

• Passive smoking
  – During pregnancy
  – Ongoing

• Bronchial hyper-responsiveness
Rhinovirus (RV) Wheezing versus Respiratory Syncytial Virus (RSV) Wheezing in First 3 Years and Asthma at 6 Years

Clinical features

May be asymptomatic now
Peak flow - not reliable due to poor technique
Reversible airflow obstruction on spirometry
Symptoms
  – expiratory wheeze
  – SOB
  – sometimes cough may be the only symptom
  – symptoms worse at night or with exposures to allergen, changes in weather, stress
  – may feel chest tightness
  – young children may vomit or have reduced appetite
Diagnosis

- **Clinical features that increase the probability of asthma:**
  - More than one of the following symptoms especially if frequent, worse at night/early morning/after exercise/exposure to triggers etc.

- Wheeze
  - Cough
  - Difficulty breathing,
  - Chest tightness

- Atopic disorder
- FH of atopic disorder/asthma
- Improvement in symptoms or lung function with adequate therapy

- **Clinical features that lower the probability of asthma:**
  - Symptoms with URI only
  - No interval symptoms
  - Isolated cough in the absence of wheeze or difficulty breathing
  - History of moist cough
  - Prominent dizziness, light-headedness, peripheral tingling
  - Repeatedly normal physical examination of chest when symptomatic
  - Normal PEFR/spirometry when symptomatic
  - No response to a trial of asthma therapy
  - Clinical features pointing to alternative diagnosis

*BTS/SIGN (May 2008). British Guideline on the Management of Asthma*
Asthma Predictive Index

- Identify high risk children (2 and 3 years of age):
  - ≥4 wheezing episodes in the past year (at least one must be MD diagnosed)

  PLUS

- One major criterion
  - Parent with asthma
  - Atopic dermatitis
  - Aero-allergen sensitivity

  OR

- Two minor criteria
  - Food sensitivity
  - Peripheral eosinophilia (≥4%)
  - Wheezing not related to infection

Definitions

• Severity: the intrinsic intensity of the disease process
• Control: the degree to which asthma manifestations are minimized by therapy
• Impairment: frequency and intensity of symptoms and limitations patient is experiencing
• Risk: likelihood of exacerbation, decline in lung function or adverse effects of therapy
Goal of Therapy: Control of Asthma

• Reduce Impairment
  – Prevent chronic, troublesome symptoms
  – Require infrequent SABA use
  – Maintain normal pulmonary function
  – Maintain normal activity
  – Meet families’ expectations

• Reduce Risk
  – Prevent recurrent exacerbations
  – Prevent loss of lung function
  – Optimal pharmacotherapy with minimal adverse effects of therapy
Long Term Control Medications

- Corticosteroids—inhaled and oral
- Leukotriene Modifiers
- Long-acting beta agonists—with or without inhaled steroids
- Methylxanthines
- Cromolyn sodium
- Immunomodulators
Quick Relief Medications

• Short acting beta agonists:
  – Relief of acute symptoms
  – Prevention of EIB
• Anticholinergics:
  – Additive to beta agonist in severe exacerbation
  – Alternative if beta agonist not tolerated
Stepwise Approach

Aims to:

• Abolish symptoms as soon as possible
• Optimize function by starting treatment at the level most likely to achieve this
• Emphasizes control for ongoing management
Stepwise Approach

• Three age groups (0-4, 5-11, ≥12)
• Six steps
• ICS continue as preferred long-term therapy in all ages
• Equal preference for medium dose ICS and low dose ICS + LABA in Step 3 in ≥5
• Omalizumab recommended in ≥12 for those on Step 5 or 6
**FIGURE 4–2a. CLASSIFYING ASTHMA SEVERITY AND INITIATING TREATMENT IN CHILDREN 0–4 YEARS OF AGE**

Assessing severity and initiating therapy in children who are not currently taking long-term control medication.

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity (0–4 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>0</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>
<tr>
<td><strong>Risk</strong></td>
<td></td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year</td>
</tr>
<tr>
<td></td>
<td>Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time.</td>
</tr>
<tr>
<td></td>
<td>Exacerbations of any severity may occur in patients in any severity category.</td>
</tr>
</tbody>
</table>

**Recommended Step for Initiating Therapy**

(See figure 4–1a for treatment steps.)

- **Step 1**: In 2–6 weeks, depending on severity, evaluate level of asthma control that is achieved. If no clear benefit is observed in 4–6 weeks, consider adjusting therapy or alternative diagnoses.
**Step 1**  
*Preferred:* Low-dose ICS  
*Alternative:* Cromolyn or Montelukast

**Step 2**  
*Preferred:* Medium-dose ICS + either LABA or Montelukast

**Step 3**  
*Preferred:* High-dose ICS + either LABA or Montelukast

**Step 4**  
*Preferred:* Oral systemic corticosteroids

**Step 5**  
*Preferred:* High-dose ICS + either LABA or Montelukast

**Step 6**  
Step up if needed  
*First,* check adherence, inhaler technique, and environmental control

**Assess control**  
Step down if possible  
(and asthma is well controlled at least 3 months)

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**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.
### FIGURE 4–3a. ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN CHILDREN 0–4 YEARS OF AGE

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Classification of Asthma Control (0–4 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well Controlled</td>
</tr>
<tr>
<td><strong>Impairment</strong></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</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>for symptom control</td>
<td>(not prevention of EIB)</td>
</tr>
<tr>
<td>(EIB)</td>
<td></td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td>Exacerbations requiring oral systemic corticosteroids</td>
</tr>
<tr>
<td>Treatment-related</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>
<tr>
<td>adverse effects</td>
<td></td>
</tr>
</tbody>
</table>

### Recommended Action for Treatment

(See figure 4–1a for treatment steps.)

- Maintain current treatment.
- Regular follow up every 1–6 months.
- Consider step down if well controlled for at least 3 months.
- Step up (1 step) and reevaluate in 2–6 weeks.
- If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy.
- For side effects, consider alternative treatment options.
- Consider short course of oral systemic corticosteroids.
- Step up (1–2 steps), and reevaluate in 2 weeks.
- If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy.
- For side effects, consider alternative treatment options.
ICS Therapy in Preschool Children

- Multicenter, double-blind, randomized placebo controlled study designed to determine if ICS therapy can modify the subsequent development of asthma in high risk children

- Children with a positive asthma predictive index (2–3 years of age, N=285) treated with either fluticasone 88 µg BID or placebo for 2 years followed by a year of observation

- Primary outcome variable: Proportion of episode free days

The increase in symptom free days in the fluticasone cohort during the treatment period was lost in the 12 months subsequent during the observation period.

MIST

• Maintenance vs. Intermittent Inhaled Steroids in Wheezing Toddlers (MIST)
Maintenance versus Intermittent Inhaled Steroids in Wheezing Toddlers (MIST) Study

- 12 month randomized, double blinded, active control: 278 children (12–53 months)
- 4 episodes of wheezing last year: Positive modified asthma predictive index
  - 1 episode: OCS, emergency department, urgent care or hospital
- Primary outcome: Exacerbation with OCS
# MIST Study

<table>
<thead>
<tr>
<th>Run-in: 2 weeks</th>
<th>Treatment Phase: 52 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo run-in nightly + Albuterol PRN</td>
<td>Randomized Treatment Group</td>
</tr>
<tr>
<td></td>
<td>Nightly, except during RTI</td>
</tr>
<tr>
<td></td>
<td>During RTIs only for 7 days</td>
</tr>
<tr>
<td>Daily low dose budesonide</td>
<td>0.5 mg PM</td>
</tr>
<tr>
<td>Intermittent high dose budesonide</td>
<td>Placebo PM</td>
</tr>
<tr>
<td></td>
<td>1.0 mg AM</td>
</tr>
<tr>
<td></td>
<td>1.0 mg PM</td>
</tr>
</tbody>
</table>
MIST Study

- Exacerbations 0.95/patient year; $p=0.6$
- Similar time to first exacerbation; $p=0.87$
- No difference in treatment failures or episode free days
- Height=0.26 cm average difference; weight=0.16 Kg average difference
### Figure 4-2b. Classifying Asthma Severity and Initiating Treatment in Children 5–11 Years of Age

Assessing severity and initiating therapy in children who are not currently taking long-term control medication.

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity (5–11 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</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>
<tr>
<td>Lung function</td>
<td>• Normal FEV₁ between exacerbations</td>
</tr>
<tr>
<td></td>
<td>• FEV₁/FVC &gt; 85%</td>
</tr>
<tr>
<td>Risk</td>
<td>0–1/year (see note)</td>
</tr>
</tbody>
</table>

#### Recommended Step for Initiating Therapy

(See figure 4-1b for treatment steps.)

- **Step 1**: In 2–6 weeks, evaluate level of asthma control that is achieved, and adjust therapy accordingly.
- **Step 2**: Step 3, medium-dose ICS option and consider short course of oral systemic corticosteroids
- **Step 3, medium-dose ICS option, or step 4**
FIGURE 4-1b. STEPWISE APPROACH FOR MANAGING ASTHMA IN CHILDREN 5–11 YEARS OF AGE

Intermittent Asthma
Consult with asthma specialist if step 4 care or higher is required. Consider consultation at step 3.

Step 1
Preferred: Low-dose ICS
Alternative: Cromolyn, LTRA, Nedocromil, or Theophylline

Step 2
Preferred: Either: Low-dose ICS + either LABA, LTRA, or Theophylline OR Medium-dose ICS
Alternative: Medium-dose ICS + LABA

Step 3
Preferred: High-dose ICS + LABA
Alternative: High-dose ICS + either LTRA or Theophylline

Step 4
Preferred: High-dose ICS + LABA + oral systemic corticosteroid
Alternative: High-dose ICS + either LTRA or Theophylline + oral systemic corticosteroid

Step 5
Preferred: High-dose ICS + LABA + oral systemic corticosteroid
Alternative: High-dose ICS + either LTRA or Theophylline + oral systemic corticosteroid

Each step: Patient education, environmental control, and management of comorbidities.

Steps 2–4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma (see notes).

Quick-Relief Medication for All Patients
- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Short course of oral systemic corticosteroids may be needed.
- Caution: Increasing use of SABA or use >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step up treatment.
**Figure 4-3b. Assessing Asthma Control and Adjusting Therapy in Children 5–11 Years of Age**

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Classification of Asthma Control (5–11 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well Controlled</td>
</tr>
<tr>
<td><strong>Symptoms</strong></td>
<td>≤2 days/week but not more than once on each day</td>
</tr>
<tr>
<td><strong>Nighttime awakenings</strong></td>
<td>≤1x/month</td>
</tr>
<tr>
<td><strong>Interference with normal activity</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td>≤2 days/week</td>
</tr>
<tr>
<td><strong>Short-acting beta-agonist use for symptom control (not prevention of EIB)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Lung function</strong></td>
<td>&gt;80% predicted/personal best</td>
</tr>
<tr>
<td>• FEV₁ or peak flow</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>• FEV₁/FVC</td>
<td></td>
</tr>
<tr>
<td><strong>Exacerbations requiring oral systemic corticosteroids</strong></td>
<td>0–1/year</td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Reduction in lung growth</strong></td>
<td>Evaluation requires long-term followup.</td>
</tr>
<tr>
<td><strong>Treatment-related adverse effects</strong></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>

**Recommended Action for Treatment**

*See figure 4–1b for treatment steps.*

- Maintain current step.
- Regular followup every 1–6 months.
- Consider step down if well controlled for at least 3 months.
- Step up at least 1 step and
- Reevaluate in 2–6 weeks.
- For side effects: consider alternative treatment options.
- Consider short course of oral systemic corticosteroids,
- Step up 1–2 steps, and
- Reevaluate in 2 weeks.
- For side effects, consider alternative treatment options.
CAMP: ICS Reduced Oral Prednisone Use

First Course of Prednisone

Cumulative Probability

Time (y)

0 1 2 3 4

Budesonide
Nedocromil
Placebo

P < .001 budesonide vs placebo
P = .32 nedocromil vs placebo

CAMP = Childhood Asthma Management Program.
Prednisone Use

- Budesonide
- Nedocromil
- Placebo

Prednisone Courses

No./100 Person-Year

- Budesonide: 70
- Nedocromil: 102
- Placebo: 122

P < .001
P = .01

Corticosteroid Dose Response Curves for Various Outcomes

Symptoms (reduction)
FEV$_1$ (increase)
Exercise (FEV$_1$) (increase)
Nitric oxide (reduction)
FEF$_{25-75\%}$ (increase)

**Figure 4-6. Classifying Asthma Severity and Initiating Treatment in Youths ≥12 Years of Age and Adults**

Assessing severity and initiating treatment for patients who are not currently taking long-term control medications.

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity</th>
<th>Persistent</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>≥12 years of age</strong></td>
<td>Mild</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intermittent</td>
<td>&gt;2 days/week but not daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;1x/week but not nightly</td>
</tr>
<tr>
<td>Impairment</td>
<td>Nighttime awakenings</td>
<td>≤2x/month</td>
<td>3–4x/month</td>
</tr>
<tr>
<td></td>
<td>Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
<td>&gt;2 days/week but not daily, and not more than 1x on any day</td>
</tr>
<tr>
<td>Normal FEV₁/FVC:</td>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor limitation</td>
</tr>
<tr>
<td>8–19 yr</td>
<td>Lung function</td>
<td>Normal FEV₁ between exacerbations</td>
<td>FEV₁ &gt;80% predicted</td>
</tr>
<tr>
<td>20–39 yr</td>
<td></td>
<td>FEV₁/FVC normal</td>
<td>FEV₁/FVC normal</td>
</tr>
<tr>
<td>40–59 yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60–80 yr</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risk**

Exacerbations requiring oral systemic corticosteroids

- 0–1/year (see note)
- ≥2/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.

**Recommended Step for Initiating Treatment**

(See figure 4-5 for treatment steps.)

- Step 1
- Step 2
- Step 3
- Step 4 or 5

In 2–6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.
**STEPWISE APPROACH FOR MANAGING ASTHMA IN YOUTHS ≥12 YEARS OF AGE AND ADULTS**

**Step 1**
- **Preferred:** Low-dose ICS
- **Alternative:** Cromolyn, LTRA, Nedocromil, or Theophylline

**Step 2**
- **Preferred:** Low-dose ICS + LABA
- **Alternative:** Medium-dose ICS

**Step 3**
- **Preferred:** High-dose ICS + LABA
- **Alternative:** Medium-dose ICS + either LTRA, Theophylline, or Zileuton

**Step 4**
- **Preferred:** High-dose ICS + LABA + oral corticosteroid
- **Consider:** Omalizumab for patients who have allergies

**Step 5**
- **Preferred:** High-dose ICS + LABA + oral corticosteroid
- **AND**
- **Consider:** Omalizumab for patients who have allergies

**Step 6**
- Step up if needed
  - (first, check adherence, environmental control, and comorbid conditions)

**Assess control**

**Step down if possible**
- (and asthma is well controlled at least 3 months)

**Quick-Relief Medication for All Patients**
- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Short course of oral systemic corticosteroids may be needed.
- Use of SABA >2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step up treatment.

Each step: Patient education, environmental control, and management of comorbidities.

Steps 2-4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma (see notes).
### FIGURE 4-7. ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN YOUTHS ≥12 YEARS OF AGE AND ADULTS

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Classification of Asthma Control (≥12 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well Controlled</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2x/month</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>None</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Short-acting beta&lt;sub&gt;2&lt;/sub&gt;-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>FEV&lt;sub&gt;1&lt;/sub&gt; or peak flow</td>
<td>&gt;80% predicted/personal best</td>
</tr>
<tr>
<td>Validated questionnaires</td>
<td></td>
</tr>
<tr>
<td>ATAQ</td>
<td>0</td>
</tr>
<tr>
<td>ACQ</td>
<td>≤0.75&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>ACT</td>
<td>≥20</td>
</tr>
<tr>
<td>FEV&lt;sub&gt;1&lt;/sub&gt; or peak flow</td>
<td></td>
</tr>
<tr>
<td>Risk</td>
<td>Exacerbations requiring oral systemic corticosteroids</td>
</tr>
<tr>
<td></td>
<td>Consider severity and interval since last exacerbation</td>
</tr>
<tr>
<td>Progressive loss of lung function</td>
<td>Evaluation requires long-term followup care</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>

**Recommended Action for Treatment**

(see figure 4–5 for treatment steps)

- Maintain current step.
- Regular followups every 1–6 months to maintain control.
- Consider step down if well controlled for at least 3 months.
- Step up 1 step and reevaluate in 2–6 weeks.
- For side effects, consider alternative treatment options.
- Consider short course of oral systemic corticosteroids.
- Step up 1–2 steps, and reevaluate in 2 weeks.
- For side effects, consider alternative treatment options.
Childhood Asthma Control Test™

Childhood Asthma Control Test for children 4 to 11 years old.

Know the score.

This test will provide a score that may help your doctor determine if your child's asthma treatment plan is working or if it might be time for a change.

How to take the Childhood Asthma Control Test

Step 1: Have your child respond to the first four questions (1 to 4). If your child needs help reading or understanding the question, you may help, but let your child select the response. Complete the remaining three questions (5 to 7) on your own and without letting your child's response influence your answers. There are no right or wrong answers.

Step 2: Write the number of each answer in the score box provided.

Step 3: Add up each score box for the total.

Step 4: Take the test to the doctor to talk about your child's total score.

Have your child complete these questions.

1. How is your asthma today?
   - Very bad
   - Bad
   - Good
   - Very good

2. How much of a problem is your asthma when you run, exercise or play sports?
   - A little
   - A lot
   - I can't do what I want to do.
   - It's a problem and I don't like it.
   - It's a little problem but it's okay.
   - It's not a problem.

3. Do you cough because of your asthma?
   - Yes, all of the time.
   - Yes, most of the time.
   - Yes, some of the time.
   - No, none of the time.

4. Do you wake up during the night because of your asthma?
   - Yes, all of the time.
   - Yes, most of the time.
   - Yes, some of the time.
   - No, none of the time.

Please complete the following questions on your own.

5. During the last 4 weeks, on average, how many days per month did your child have any daytime asthma symptoms?
   - Not at all
   - 1-3 days/mo
   - 4-10 days/mo
   - 11-18 days/mo
   - 19-24 days/mo
   - Everyday

6. During the last 4 weeks, on average, how many days per month did your child wake up during the day because of asthma?
   - Not at all
   - 1-3 days/mo
   - 4-10 days/mo
   - 11-18 days/mo
   - 19-24 days/mo
   - Everyday

7. During the last 4 weeks, on average, how many days per month did your child wake up during the night because of asthma?
   - Not at all
   - 1-3 days/mo
   - 4-10 days/mo
   - 11-18 days/mo
   - 19-24 days/mo
   - Everyday

Please turn this page over to see what your child's total score means.
What Else is New?

• Black box warning for ICS/LABA not present now (and approved to age 6)

• Biologic therapies
  – Omalizumab (age 6 and older)—Anti-IgE
  – Mepolizumab (age 12 and older)—Anti-IL-5
  – Benralizumab (age 12 and older)—Anti-IL-5
Education and Environmental Control

- Multifaceted approach
- Patient education in expanded settings
  - Clinic, ED, hospitalization, pharmacy, schools, community, home
- Environmental control
  - Multiple simultaneous interventions
  - Consideration of immunotherapy
  - Treatment of comorbidities
Managing Environmental Factors

- Evaluate for the role of allergens
- Reduce exposure to known sensitized allergens
- Avoid tobacco smoke
- Avoid other respiratory irritants
- Avoid exertion on high pollution days
Managing Environmental Factors

- Stepwise is often more manageable
- Make the bedroom a safe haven
- Don’t skip the basics, e.g. change HVAC filters regularly before buying an air filter
- Use available resources:
  - http://www.epa.gov/asthma/triggers.html
  - http://www.nationaljewish.org/healthinfo/conditions/asthma/lifestyle-management/environmental
Managing Co-Morbidities

• Things to consider when not in control:
  – Intrinsic airway narrowing or obstruction
  – Infection—persistent bacterial bronchitis
  – Aspiration—GERD
  – Other diagnoses—cystic fibrosis, primary ciliary dyskinesia, immunodeficiency
Medication Adherence

• Generally poor independent of severity, control, socioeconomic status
• Difficult to accurately ascertain
  – Self-report
  – Biomarkers – sputum eosinophils, eNO (increased in eosinophilic airway inflammation)
  – Pharmacy inquiries vs claims made
• Strategies for improvement
  – Reminders – medication placement, stickie notes, calendars, cell phone alarms, other electronics
  – Engage the patient directly – Age/Developmentally appropriate “Quizzes” with incentives
  – Asthma camps
Improving Administration

- Reinforce proper inhaler technique
  - Assessment of inhaler technique in 296 children 8-16 years old in 5 pediatric practices
    - 8.1% MDI
    - 15.6% turbuhaler
    - 22% diskus

Leveraging Community Resources

• Home Health Nursing visits
  – Environmental assessment/control education
  – Medication reconciliation
  – In-home asthma education

• Schools
  – Administration of ICS by school health staff
  – Tracking of symptoms, ACT
  – Asthma education - ALA (800-LUNG-USA)
    • Open Airways for Schools
    • Asthma 101
  – Need for two-way communication – get high risk patients into the office
Assessing Risk

- ≥ 2 ED visits or hospitalizations in the past year
- Any history intubation, ICU admission, especially in past 5 years
- Use of > 2 albuterol/levalbuterol MDIs in past year
- Severe (persistent) airflow obstruction
- Poor perception of obstruction
- Psychiatric disease
Illness Self-Management

• Summer camp survey: 31% of 9-12 year olds, 77% of 13-16 year olds independently take OTC analgesics, cold meds
  
• 92% feel no need to inform adult caregiver

• Over half of inner-city Baltimore and Washington, DC asthmatic children (mean age 8.3 ± 2.0 years) responsible for their own medications

Asthma Self-Management: Who is Ready?

• Cross-sectional study of K-10th grade
  – Children ≤ 7 lack knowledge, judgment
  – Children consistently 12-16 capable
  – Children 8-11 inconsistent

• Cautions
  – Reassess annually
  – Take into account complexity of regimen

When to refer?

- Diagnostic uncertainty
- Severity at a Step 2-3 (little kids) or above
- Symptoms present from birth
- Excessive vomiting
- Severe URTI
- Persistent wet cough
- Growth faltering
- Family history of unusual chest disease
- Unexpected clinical findings (e.g. focal chest signs or dysphagia)
- Failure to respond to conventional treatment
- Parental anxiety
Questions?