Asthma Management for the Athlete

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2nd Annual Sports Medicine Symposium: The Pediatric Athlete
March 2nd, 2018
Disclosures

The content of this presentation does not relate to any product of a commercial entity; therefore, I have no relationships to report.
Objectives

• Overview of pediatric asthma and asthma in athletes
• Review pathophysiology of asthma
• Discuss diagnosis and management of pediatric asthma
• Discuss diagnosis and management of exercise-induced bronchoconstriction or exercise-induced asthma
Epidemiology

• 1 out of 10 (10%) children has asthma
  • Boys > Girls
  • Non-Hispanic black children has the highest rates of asthma (17%)
• 70% of patients with asthma have allergies
• In 2015 in the USA, there were 3,615 asthma-related deaths
  • 219 were children
• In Utah, in 2014 –
  • 7.0% of Utah children (~63,874 children) have asthma
  • 779 hospitalizations for pediatric asthma
  • 2819 ER visits for pediatric asthma
What is Asthma?

• Chronic inflammatory disorder of the airways
• Characterized by airway hyperresponsiveness and variable and reversible airway obstruction
Symptoms

- Episodic or recurrent wheezing
- Breathlessness
- Chest tightness or pain
- Coughing –
  - At night or early morning
  - After exercise
  - After exposure to cold, dry air
Pathophysiology

- Chronic inflammation → Increased inflammatory mediators → Excessive mucus production and bronchial smooth muscle constriction
- Small airways (2-5 mm) are most affected
During an asthma exacerbation, there is

• Decreased maximal expiratory flow rates
• Increased residual volumes due to air trapping
• Dynamic hyperinflation
• Increased respiratory rate
• Inefficient respiratory muscle work → fatigue → respiratory failure
C.

<table>
<thead>
<tr>
<th>Spirometry measure</th>
<th>Predicted</th>
<th>Before bronchodilator</th>
<th>After bronchodilator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Best</td>
<td>% of predicted</td>
</tr>
<tr>
<td>FVC, L</td>
<td>3.70</td>
<td>3.30</td>
<td>89</td>
</tr>
<tr>
<td>FEV\textsubscript{1}, L</td>
<td>2.94</td>
<td>1.80</td>
<td>61</td>
</tr>
<tr>
<td>Ratio FEV\textsubscript{1}/FVC, %</td>
<td>80</td>
<td>55</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note: FEV\textsubscript{1} = forced expiratory volume in 1 second, FVC = forced vital capacity, NA = not applicable.
Exercise as Asthma Trigger, Exercise-Induced Asthma (EIA) and, Exercise-Induced Bronchospasm (EIB)

- EIA = EIB + symptoms
- Exercise is a trigger for:
  - Over 80% of patients with asthma
  - 40% of non-asthmatic patients with allergic rhinitis in season
- EIB – 20% prevalence in non-asthmatics
  - 30-70% of Olympic or elite-level athletes
- EIA
  - 12-15% prevalence in general population
  - Up to 23% in school-age children and athletes
  - Common for athletes in endurance sports where there is exposure to cold, dry air or irritants (eg, cross-country skiing, long-distance running, swimming)
Winter Sports Athletes

• Asthma is more common in US Olympic athletes who participate in winter sports (20%) vs. summer sports (17%)
• EIA is more common in females (26%) compared to males (18%)
Pathophysiology of EIA or EIB

- Cooling/warming hypothesis
  - Increased ventilation → airway cooling → bronchoconstriction

- Drying hypothesis
  - Increased ventilation → airway cooling → airway dehydration (less moisture in cold air) → increased inflammation

- Environmental factors
  - Increased exposure to environmental allergens and irritants/pollutants → immune/inflammatory activation and dysregulation

- Genetic susceptibility
  - Inherently abnormal innate immune cells
Climate Effects

• Breathing warm and humid air during exercise almost but not completely abolishes EIA

• Breathing dry, cold air increases EIA severity
  • Triggers for bronchoconstriction:
    • Respiratory heat loss during exercise
    • Hyperventilation
    • More strenuous exercise

• Changes in osmolarity of airway surface fluid from cooling and rewarming of airway mucosa → Hyperemia and bronchial obstruction → EIA and hyperventilation-induced asthma
Diagnosis of EIA and EIB

• Symptoms with exercise – dyspnea, coughing, chest tightness/pain, wheezing, decreased exercise tolerance
• Onset around 5-8 minutes after start of intense exercise
• Specific sports, specific environments
• Exercise-induced bronchoconstriction: Airway obstruction with exercise of at least 10-15% decrease in baseline FEV1 after an exercise challenge test

<table>
<thead>
<tr>
<th>Severity of EIB</th>
<th>% decline in pre-exercise FEV1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>≥10% and &lt;25%</td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt;25% and &lt;50%</td>
</tr>
<tr>
<td>Severe</td>
<td>≥50%</td>
</tr>
</tbody>
</table>
Diagnostic and Treatment Algorithm for EIB

1. Symptoms Suggestive of EIB
   - Exercise Challenge *
     - Δ FEV1 post challenge ≥10-15%?
       - Yes: EIB Confirmed
       - No: Consider alternative Dx

2. Consider Treatment
   - Pharmacologic
     - Prevent symptoms
       - SABAs 5-20 min before exercise (consider addition of MCSA and/or anticholinergic if SABA not working)
       - Used daily or more?
         - Consider addition of controller therapy (daily ICS+/LABA, and/or LTRA; antihistamines if allergic)
   - Treat symptoms
     - SABAs
   - Non-pharmacologic (prevent symptoms only)
     - Warm-up exercise
     - Face mask or scarf
     - Dietary modification
Medications for Exercise-Induced Bronchoconstriction / Asthma

• Short-acting β2-agonist (SABA) 10-15 minutes before exercise
• If using daily SABA or more frequently, then start:
  • Daily inhaled corticosteroids (ICS) therapy
  • Daily leukotriene receptor antagonist (i.e., montelukast)
  • Mast cell stabilizing agent (i.e., sodium cromoglycate, nedocromil sodium) before exercise (not available in USA)
  • Consider inhaled anticholinergic agent (i.e., ipratropium) before exercise
• In patients with EIB and allergies:
  • Consider daily antihistamine

Do not use long-acting β2-agonist as single agent therapy or ICS only prior to exercise
Non-Pharmacologic Therapy for Exercise-Induced Bronchoconstriction

- Interval or combination warm-up exercise before planned exercise
- For cold weather athletes, use of device (i.e., facemask, scarf) that warms and humidifies the air during exercise
- Dietary suggestions – low-salt, fish oil supplementation, ascorbic acid, avoid lycopene supplements
Principles of Asthma Management

1. Identify and eliminate exacerbating or aggravating factors
2. Pharmacologic therapies
3. Education of patient and family about:
   • Disease process
   • Management skills to avoid and treat acute exacerbations
Goals of Management

1. Minimize symptoms and exacerbations
2. Maintain normal activities of daily living
3. Maintain normal or near-normal lung function
4. Avoid adverse effects from asthma medications
National Asthma Education and Prevention Program (NAEPP) 2007 Guidelines

• 4 severity classifications
  • Intermittent
  • Persistent - Mild, Moderate, Severe

• Successful asthma management involves
  • Determining severity over time and serial assessment
  • Assessing level of asthma control based on impairment and risk
    • Questionnaires - Asthma Control Test (ACT), Asthma Therapy Assessment Questionnaire (ATAQ), etc
Childhood Asthma Control Test for children 4 to 11 years

Know your score.

Parent or Guardian: The Childhood Asthma Control Test® is a way to help your child's healthcare provider determine if your child's asthma symptoms are well controlled.

Take this test with your child (ages 4 to 11). Share the results with your child's healthcare provider.

Step 1: Have your child answer the first four questions (1 to 4). If your child needs help, you may help, but let your child choose the answer.

Step 2: Answer the last three questions (5 to 7) on your own. Don't let your child's answers influence yours. There are no right or wrong answers.

Step 3: Write the number of each answer in the score box to the right.

Step 4: Add up each score box for the total.

Step 5: Take the COMPLETED test to your child's healthcare provider 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?
   - Very bad
   - Bad
   - Good
   - Very good

3. Is it a big problem, I can't do what I want to do. It's a problem and I don't like it.
   - 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, how many days did your child have any daytime asthma symptoms?
   - Not at all
   - 1-3 days
   - 4-10 days
   - 11-18 days
   - 19-24 days
   - Everyday

6. During the last 4 weeks, how many days did your child wheeze during the day because of asthma?
   - Not at all
   - 1-3 days
   - 4-10 days
   - 11-18 days
   - 19-24 days
   - Everyday

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

IF YOUR CHILD'S SCORE IS 19 OR LESS, YOUR CHILD'S ASTHMA SYMPTOMS MIGHT NOT BE WELL CONTROLLED AS THEY COULD BE. NO MATTER WHAT THE SCORE, BRING THIS TEST TO YOUR CHILD'S HEALTHCARE PROVIDER TO TALK ABOUT YOUR CHILD'S RESULTS.

NOTE: If your child's score is 18 or less, his or her asthma may be very poorly controlled. Please contact your child's healthcare provider right away.
FIGURE 3-8. VALIDATED INSTRUMENTS FOR ASSESSMENT AND MONITORING OF ASTHMA

- Asthma Control Questionnaire (Juniper et al. 1999b)
- Asthma Therapy Assessment Questionnaire (Vollmer et al. 1999) (See below.)
- Asthma Control Test (Nathan et al. 2004) (See below.)
- Asthma Control score (Boulet et al. 2002)

ASTHMA THERAPY ASSESSMENT QUESTIONNAIRE® (ATAQ)

1. In the past 4 weeks did you miss any work, school, or normal daily activities because of your asthma? (1 point for YES)
2. In the past 4 weeks, did you wake up at night because of your asthma? (1 point for YES)
3. Do you believe your asthma was well controlled in the past 4 weeks? (1 point for NO)
4. Do you use an inhaler for quick relief from asthma symptoms? If yes, what is the highest number of puffs in 1 day you took of this inhaler? (1 point for more than 12)

Total points = 0–4, with more points indicating more control problems

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ASTHMA CONTROL TEST™

This survey was designed to help you describe your asthma and how your asthma affects you and what you are able to do. To complete it, please mark an X in the one box that best describes your answer.

1. In the past 4 weeks, how much of the time did your asthma keep you from getting as much done at work or at home?
   - All of the time
   - Most of the time
   - Some of the time
   - A little of the time
   - None of the time

2. During the past 4 weeks, how often have you had shortness of breath?
   - More than once a day
   - Once a day
   - Twice a week
   - Once or twice a week
   - Not at all

3. During the past 4 weeks, how often did your asthma symptoms (wheeze, cough, shortness of breath, chest tightness or pain) make you up at night or earlier than usual in the morning?
   - 4 or more nights a week
   - 2 to 3 nights a week
   - Once a week
   - Once or Twice
   - Not at all

4. During the past 4 weeks, how often have you used your rescue inhaler or controller medication (such as Albuterol, Ventolin, Proventil, Maxair, or Primatene Mist)?
   - 8 or more times per day
   - 4 to 8 times per day
   - 2 to 4 times per day
   - Once a week
   - Not at all

5. How would you rate your asthma control during the past 4 weeks?
   - Completely Controlled
   - Well Controlled
   - Somewhat Controlled
   - Poorly Controlled
   - Not Controlled at all

For information on the interpretation and scoring of the Asthma Control Test™ (ACT™), visit www.qualitymetrics.com


CAUTION: The sample questionnaires in figure 3-8 assess only the impairment domain of asthma control and NOT the risk domain. Measure of risk, such as exacerbations, urgent care, hospitalizations, and declines in lung function, are important elements of assessing the level of asthma control.

www.nhlbi.nih.gov/guidelines/asthma
Categories of Asthma Control

- Well-controlled
- Not well-controlled
- Poorly controlled
Assessing Impairment in Asthma Control

• Daytime symptoms
• Nighttime symptoms
• Activity limitation
• Short acting β-agonist (SABA) use
• Perceived asthma control
Assessing Risk in Asthma Control

- Exacerbations – severe enough to warrant oral corticosteroids, emergency medical care, or hospitalizations

- Predicting future exacerbations –
  - FEV1 predicts exacerbation in subsequent year
  - 1 severe exacerbation predicts exacerbation in same year
  - Is there a correlation between the # exacerbations and degree of asthma control?
  - > 1 exacerbation/year = inadequate asthma control
**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>Symptoms</td>
<td></td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td></td>
</tr>
<tr>
<td>Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td></td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
</tbody>
</table>

**Risk**

- Exacerbations requiring oral systemic corticosteroids: 0-1/year

Exacerbations of any severity may occur in patients in any severity category.

**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.

**Key:**

- EIB, exercise-induced bronchospasm
### 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 beta-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>
</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 Therapy

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

- Step 1
- Step 2
- Step 3, medium-dose ICS option, or step 4, and consider short course of oral systemic corticosteroids

In 2-6 weeks, evaluate level of asthma control that is achieved, and adjust therapy accordingly.

Key: EIB, exercise-induced bronchospasm; FEV1, forced expiratory volume in 1 second; FVC, forced vital capacity; ICS, inhaled corticosteroids
### FIGURE 14. 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>Intermittent</td>
<td>Mild</td>
<td>Severe</td>
</tr>
<tr>
<td>Impairment</td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Normal FEV&lt;sub&gt;1&lt;/sub&gt;/FVC:</td>
<td>8–19 yr 85%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20–39 yr 80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40–59 yr 75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60–80 yr 70%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor limitation</td>
<td>Some limitation</td>
</tr>
<tr>
<td>Lung function</td>
<td>• Normal FEV&lt;sub&gt;1&lt;/sub&gt; between exacerbations</td>
<td>• FEV&lt;sub&gt;1&lt;/sub&gt; &gt;80% predicted</td>
<td>• FEV&lt;sub&gt;1&lt;/sub&gt; &gt;80% predicted</td>
</tr>
<tr>
<td></td>
<td>• FEV&lt;sub&gt;1&lt;/sub&gt;/FVC normal</td>
<td>• FEV&lt;sub&gt;1&lt;/sub&gt;/FVC normal</td>
<td>• FEV&lt;sub&gt;1&lt;/sub&gt;/FVC reduced 5%</td>
</tr>
<tr>
<td>Risk</td>
<td>• Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year (see note)</td>
<td>&gt;2/year (see note)</td>
</tr>
</tbody>
</table>

### Recommended Step for Initiating Treatment
(See "Stepwise Approach for Managing Asthma" 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
- **Step 3**: and consider short course of oral systemic corticosteroids
- **Step 4 or 5**:
**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></td>
<td>Not Well Controlled</td>
</tr>
<tr>
<td></td>
<td>Very Poorly Controlled</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td></td>
<td>&gt;2 days/week</td>
</tr>
<tr>
<td></td>
<td>Throughout the day</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤1x/month</td>
</tr>
<tr>
<td></td>
<td>&gt;1x/month</td>
</tr>
<tr>
<td></td>
<td>&gt;1x/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Some limitation</td>
</tr>
<tr>
<td></td>
<td>Extremely limited</td>
</tr>
<tr>
<td>Shortacting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td></td>
<td>&gt;2 days/week</td>
</tr>
<tr>
<td></td>
<td>Several times per day</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>2–3/year</td>
</tr>
<tr>
<td></td>
<td>&gt;3/year</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 4–1a for treatment steps.)

- **Well Controlled:** Maintain current treatment. Regular followup every 1–6 months. Consider step down if well controlled for at least 3 months.
- **Not Well Controlled:** 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.
- **Very Poorly Controlled:** 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.

Key: EIB, exercise-induced bronchospasm
### 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>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well Controlled</td>
<td>Not Well Controlled</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week but not more than once on each day</td>
<td>&gt;2 days/week or multiple times on ≤2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤1 x/week</td>
<td>≥2 x/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Some limitation</td>
</tr>
<tr>
<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
<td>&gt;2 days/week</td>
</tr>
<tr>
<td>Lung function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEV₁ or peak flow</td>
<td>&gt;80% predicted/ personal best</td>
<td>60–80% predicted/ personal best</td>
</tr>
<tr>
<td>FEV₁/FVC</td>
<td>&gt;80%</td>
<td>75–80%</td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year</td>
<td>≥2/year (see note)</td>
</tr>
<tr>
<td>Risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction in lung growth</td>
<td>Evaluation requires long-term followup.</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>
<td></td>
</tr>
<tr>
<td><strong>Recommended Action for Treatment</strong> (See figure 4-3b for treatment steps.)</td>
<td>Maintain current step; Regular followup every 1–6 months.</td>
<td>Step up at least 1 step and Reevaluate in 2–6 weeks.</td>
</tr>
</tbody>
</table>

Key: EIB, exercise-induced bronchospasm; FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity
**FIGURE 15. 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>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well Controlled</td>
<td>Not Well Controlled</td>
<td>Very Poorly Controlled</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
<td>&gt;2 days/week</td>
<td>Throughout the day</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2x/month</td>
<td>1–3x/week</td>
<td>≥4x/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Some limitation</td>
<td>Extremely limited</td>
</tr>
<tr>
<td>Short-acting beta,-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
<td>&gt;2 days/week</td>
<td>Several times per day</td>
</tr>
<tr>
<td>FEV1 or peak flow</td>
<td>&gt;80% predicted/personal best</td>
<td>60–80% predicted/personal best</td>
<td>&lt;60% predicted/personal best</td>
</tr>
<tr>
<td>Validated questionnaires</td>
<td>ATAQ 0, ACQ ≤0.75, ACT ≤20</td>
<td>1–2</td>
<td>3–4</td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year</td>
<td>(≥2/year (see note)</td>
<td>Consider severity and interval since last exacerbation</td>
</tr>
<tr>
<td>Risk</td>
<td>Evaluation requires long-term followup care.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progressive loss of lung function</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>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Recommended Action for Treatment**

(See “Stepwise Approach for Managing Asthma” for treatment steps.)

- Maintain current step.
- Regular followup at every 1–6 months to maintain control.
- Consider step down if well controlled for at least 3 months.
- Step up 1 step.
- Reevaluate in 2–6 weeks.
- For side effects, consider alternative treatment options.
- Consider short course of oral systemic corticosteroids.
- Step up 1–2 steps.
- Reevaluate in 2 weeks.
- For side effects, consider alternative treatment options.
National Asthma Education and Prevention Program (NAEPP) Guidelines

• 6 Steps in Treatment Algorithms
  • Steps 5 and 6 are for adolescents (≥ 12 yrs) and adults
    • Allergic, refractory symptoms despite high-dose inhaled corticosteroids (ICSs) + another anti-inflammatory controller med
    • Tx: Oral corticosteroids, omalizumab
  
• Start at the step most appropriate to the initial severity grading
  • Or control level for those already receiving treatment

• At all steps
  • Patient education, environmental controls, management of co-morbid conditions
  • Training of patients and all caregivers of appropriate use of specific medication delivery devices and monitoring tools
FIGURE 16. STEPWISE APPROACH FOR MANAGING ASTHMA IN YOUTHS ≥12 YEARS OF AGE AND ADULTS

Intensive Asthma

Persistent Asthma: Daily Medication
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: Low-dose ICS + LABA
Preferred: Medium-dose ICS + LABA
Alternative: Low-dose ICS + either LTRA, Theophylline, or Zileuton

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

Step 4
Preferred: High-dose ICS + LABA AND
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.
When to Step Up or Step Down?

- Goal: Maintain control at lowest step level possible

- Step Up:
  - When patients are not well-controlled or poorly controlled
  - Goal: achieve control, and maintain control for at least 3 months

- Step Down:
  - Asthma is well controlled for at least 3 months
  - No other contraindications for reducing medications exist (e.g., persistent allergen exposure, entry to high-risk season)
  - Decrease ICS dose by 25-50% every 3 months to lowest dose possible required to maintain control
Immunotherapy

- Recommended for children at Steps 2-4, with documented allergy and persistent symptoms
- Most effective for those with single allergen sensitization
- Efficacy strongest for animal dander, house dust mites, pollen
Peak Flow Rate Monitoring

• Home monitoring in patients with moderate to severe persistent asthma
• Normal ranges are based on age, sex, height; individual variability
• Personal Peak Flow best means that asthma is well-controlled and optimized
• Diurnal and day-to-day Peak Flow variability is a marker of asthma severity and airway reactivity
• Most useful if used consistently, in patients with severe or unstable asthma, or around period of exacerbation
• Limitations – effort dependent, only measures large airway obstruction
# Asthma Action Plan

**Plan For:**

**Date:**

**Nurse:**

**Doctor:** Dr.

**Hospital/Emergency Phone Number:** xxx-xxxx/911

**Doctor’s Phone:** xxx-xxxx (weekdays) / xxx-xxxx (night and weekend)

## Green Zone: Doing Well

- No cough, wheeze, chest tightness, or shortness of breath during day or night
- Can do usual activities

**Peak Flow Between**

(80%~100% of my best)

Let’s take these control medicines every single day. They work to keep your lungs healthy and prevent asthma symptoms.

<table>
<thead>
<tr>
<th>Medicine</th>
<th>How Much to Take</th>
<th>When to Take It</th>
</tr>
</thead>
</table>

**Before Running or Sports:**

- □ 12 puffs □ 4 puffs □ 1 aerosol
- □ 5 to 20 minutes □ 60 minutes

## Yellow Zone: Asthma Getting Worse

- Cough, wheeze, chest tightness, or shortness of breath.
- Walking at night due to asthma.
- Can do some, but NOT all activities

**Peak Flow Between**

(50%~80% of my best)

**First:** Add quick-relief medicine: Albuterol, Ventolin, Proventil, Maxair, or Xopenx

- 1 to 2 puffs (Inhaler) or 1 aerosol (aerosol machine)
- Before exercise

**Next:** After 1 hour

- If your symptoms return to the Green Zone:
  - Take the quick-relief medicine every 6-8 hours for 1-2 days

- If your symptoms do NOT return to the Green Zone:
  - Repeat quick-relief medication now and then every 4-6 hours for 1-2 days
  - Add/Doubling Inhaled Steroid
  - Advair 100/50 or 50/500
  - Add...

**Call Doctor for more advice.

**Remember:** Continue all green zone medications.

## Red Zone: Medical Alert!

- Very short of breath.
- Quick-relief medicines have not helped.
- Cannot do usual activities.
- Symptoms are the same or worse after 24 hours in the yellow zone

**Peak Flow Less Than**

(less than 50% of my best)

Add this medicine (in addition to green and yellow zone medicines):

- □ Albuterol or...
- □ 4 puffs or □ aerosol machine

- Repeat albuterol or...
- In 20 minutes if NOT better

- Oral Steroid: one dose a day for 3-5 days
  - Take _____ pills (_____mg) prednisone OR Take _____ cc/mL Prealone or Drapred

**Then:** Call your asthma doctor (xxx-xxxx-xxxx) or pediatrician NOW:
- Go to the hospital or call an ambulance if your child is still in the RED ZONE after 20 minutes and you have not reached the doctor.
**Green**: PEFR 80% to 100% predicted/personal best; all clear, no symptoms.

Yellow: PEFR 50% to 80% predicted/personal best; indicates worsening airway obstruction or an impending attack. Symptoms include slowed play, intermittent cough, wheeze, and dyspnea.

**Red**: PEFR less than 50% predicted/personal best; indicates significant airway obstruction and need for immediate medical attention. Symptoms include severe dyspnea, retractions, continuous wheeze, or cough.
Successful asthma management involves

• Partnering with knowledgeable asthma specialist
• Frequent monitoring of asthma symptoms and response to therapy
• Objective measures of pulmonary function
• Avoidance of asthma triggers
• Risk assessment, education and support
  • Poverty - substandard housing, limited access to medical care, transportation or child care barriers
  • Impaired maternal mental health
  • Lack of social support
  • Behavioral problems
Exercise as Rx for Asthma

• Brief exercise and exercise-training modulates lung inflammatory responses to acute allergen challenges, leading to diminished pro-inflammatory control pathways.

• Exercise training in combination with anti-inflammatory therapy might synergize to attenuate airway response to methacholine challenge in children with asthma.
Resources & References


• Utah Department of Health: Utah Asthma Program – Provides resources regarding air quality, Home Visiting Program, resources for health professionals, schools, local and state partners, Utah-specific statistics http://www.health.utah.gov/asthma/