Pediatric Asthma in 2019

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Former AAPA Liaison to National Asthma Education and Prevention Program- NAEPP-CC
Physician Assistant- Pediatric Pulmonary Services- El Paso
Full-time 2007-2015
Part-time March 2017-Present

Clinical Educator/Clinical Science Liaison –Thermo Fisher
Scientific January 2017-Present
Objectives

❖ Underscore the significant burden and impact on quality of life due to pediatric asthma
❖ Understand the importance of inflammation in the upper and lower airway
❖ Review the NIH Asthma Guidelines
❖ Discuss several options for therapy of pediatric asthma
Asthma Facts

30 Million Persons

2 Million ED Visits

Over 4,900 Deaths (14/day)

Disproportionately Affects Children and African Americans

500,000 Hospitalizations

Costs of Asthma $16 Billion

American Lung Association Fact Sheet: Asthma in Adults, June 2004. Available at: http://www.lungusa.org/site/
National Institute of Allergy and Infectious Disease. Focus on Asthma. Available at: http://www.niaid.nih.gov/newsroom
Asthma Patient Demographics

US Population = 277.8 Million (US Census, 3/01)
20.3 Million Asthma Patients = 5.6% Prevalence (ALA, 2/01)

Age
<18 y 6.3 M 31%
≥18 y 14 M 69%

Severity
Mild intermittent 26%
Mild persistent 22%
Severe persistent 18%
Moderate persistent 34%

Race
Caucasian 10.8 M 5.4% prev.
Hispanic 4.2 M 11.7% prev.
Other 2.6 M
African-American 2.7 M 7.2% prev.

Gender
Male 45%
Female 55%

Asthma Facts and Figures
Morbidity and Mortality

• 20.3 million patients in US
  – Affects 4-5% of US population
  – 6.7 million in 1980
  – More than doubled in 20 years
  – Prevalence of asthma rising at a faster rate than any other chronic disease in US

• By 2020, estimated that number of people with asthma in US could nearly double to 29 million

• Asthma deaths: more than 5000/y or 14 people/d
  – Higher mortality among African-Americans
  – Tripled over past two decades
A Perspective on Pediatric Asthma

• **What’s “universal”?**
  – Asthma is a chronic inflammatory disorder

• **What’s “unique”?**
  – The burden of asthma is increasing disproportionately in children
  – The pediatric lung is *not* simply a small adult lung
    • Distinctions do exist in the disease process
Burden of Disease

Children with asthma

• Miss 10 million days of school each year
• Limit activities
• Living in poverty and/or inner cities have higher rates of hospitalizations and mortality from their asthma

Onset of Symptoms in Children With Asthma

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

Classification of Asthma

Asthma
30 million in US

Intermittent
7.3%

Persistent
92.7%

- Mild
  15.4%
- Moderate/Severe
  77.3%
Asthma Variability

• Asthma is a variable condition
• Patients frequently move between severity categories
• Asthma severity cannot be determined in many patients based upon discrete, point-in-time assessments of lung function, frequency of SABA use, or asthma symptoms
Variability of Untreated Asthma

Time

Symptoms

Mild

Severe
Challenges in Treating Childhood Asthma

Making the Diagnosis: When is it Asthma?

- Underdiagnosis is common
- Repeated cough, wheeze, chest tightness
- Repeated diagnoses of reactive airway disease, allergic bronchitis, or wheezy bronchitis
Making the Diagnosis: Challenges in Treating Childhood Asthma

When is it Asthma? (Cont’d)

▪ Symptoms worsened by viral infection, smoke, allergens, exercise, weather

▪ Symptoms occur/worsen at night

▪ Reversible airflow limitation

▪ Wheezing may or may not be present
Asthma and Wheezing in the First 6 Years

Significance of Wheezing at Age 3

- Of patients who wheezed before age 3, wheezing *persisted* through age 6 in about **40%**

Transient wheezing
- Smaller airway caliber
- No bronchial hyperresponsiveness
- Wheezing resolved by age 6

Persistent wheezing
- Atopy
- Bronchial hyperresponsiveness
- Significant deterioration in lung function by age 6

Asthma and Wheezing in the First 6 Years
When is Pulmonary Function Lost?

Based on the category of wheezing established at 6 years of age

• At age <1 year, persistent wheezers and non-wheezers had *no significant* difference in pulmonary function

• At age 6, persistent wheezers and non-wheezers had a *significant* difference ($P<0.01$) in pulmonary function

• Therefore, significant loss of pulmonary function occurred before age 6
Natural History of Childhood Asthma

Pediatric Asthma Deaths: Patients With Mild Asthma Are Also at Risk

Findings from a cohort study reviewing all pediatric asthma-related deaths (n=51) in the Australian state of Victoria from 1986 to 1989.

Asthmatic Inflammation

Asthma is a chronic inflammatory disorder

- Airway Inflammation leads to
  - Hyperresponsiveness - responses to triggers
  - Obstruction - usually fully reversible
  - Symptoms - cough, wheeze, dyspnea

- While symptoms are easily appreciated, symptoms are not the fundamental aspect of asthma

Asthma: Pathophysiologic Features and Changes in Airway Morphology

- Epithelial damage
- Inflammatory cell infiltration
- Vascular dilation
- Mucous gland hypertrophy and hyperplasia
- Edema
- Mucus hypersecretion
- Thickening of basement membrane
- Airway smooth-muscle hypertrophy, hyperplasia, and bronchoconstriction
- Inflammatory cell infiltration
- Goblet cell hyperplasia

Allergy is common in children – 80%–90% of school-aged children with asthma – “Treat the sneeze-prevent the wheeze” -E. Bronsky MD

Presence of allergy is associated with more severe and persistent asthma

Allergen exposure is associated with
- Increased risk of developing asthma
- Increased asthma morbidity
- “Allergic March”

Allergen avoidance can reduce airway hyperreactivity and asthma morbidity
Allergen Testing

Sensitization may or may not = clinical allergy
Asthma Triggers

- Allergen exposure
- Respiratory infections
- Strong expressions of emotion (laughing, crying)
- Vigorous exercise
- Cold air
- Dust

- Air pollution
- Cigarette smoke
- Household products
- Drugs
- Pets

Measures for Reducing Animal Allergens

• The ideal solution: remove pets from house
• If not possible:
  – Keep pet out of bedroom
  – Use HEPA air filtering system
  – Remove carpet and other reservoirs for allergens from bedroom
  – Encasing on mattress, box springs, and pillow
  – Wash pet weekly

Cat Wash

• Rinsing cat weekly can reduce airborne levels
  – Effect temporary and must be done at least twice/week

Courtesy of Dr David Khan UT Southwestern Dallas
Shaving the Cat?

Courtesy of Dr. David Kahn UT Southwestern Dallas
Asthma Predictive Index

H/O ≥4 wheezing episodes in the past year (at least one must be provider diagnosed)

One major criteria
- Parent with asthma
- Atopic dermatitis
- Aeroallergen sensitivity

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

If +, then 65% likelihood of developing persistent asthma
If -, then 95% likelihood of not developing persistent asthma

### Comparison of PARS to the API

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>AUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>API</td>
<td>0.57</td>
<td>0.81</td>
<td>0.69</td>
</tr>
<tr>
<td>PARS in CCAAPS (n=589)</td>
<td>0.68</td>
<td>0.77</td>
<td>0.80</td>
</tr>
<tr>
<td>PARS in IOW (n=1098)</td>
<td>0.67</td>
<td>0.79</td>
<td>0.79</td>
</tr>
</tbody>
</table>

### PARS Score and Risk of Asthma by Age 7 years

<table>
<thead>
<tr>
<th>PARS Score</th>
<th>Risk of Asthma by age 7 years</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>3%-11%</td>
<td>LOW RISK</td>
</tr>
<tr>
<td>5-8</td>
<td>15%-32%</td>
<td>MODERATE RISK</td>
</tr>
<tr>
<td>9-14</td>
<td>40%-79%</td>
<td>HIGH RISK</td>
</tr>
</tbody>
</table>
## Pediatric Asthma Risk Score (PARS) Scoring Sheet

<table>
<thead>
<tr>
<th>Possible Scores</th>
<th>No</th>
<th>Yes</th>
<th>Child’s Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Parental Asthma</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2. Eczema before age 3 years</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3. Wheezing apart from colds</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4. Wheezing before age 3 years</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5. African-American Race</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6. SPT positive to ≥ 2 aero and/or food allergens</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Child’s PARS (add lines 1-6 above):
## Patient Score Interpretation

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk of Asthma by age 7 years</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3%</td>
<td><strong>LOW RISK</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children with these scores have a 1 in 33 [score of 0] to a 1 in 9 [score of 4] risk of developing asthma by age 7 years</td>
</tr>
<tr>
<td>2</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>15%</td>
<td><strong>MODERATE RISK</strong></td>
</tr>
<tr>
<td>6</td>
<td>19%</td>
<td>Children with these scores have a 1 in 7 risk [Score of 5] to a 1 in 3 [Score of 8] risk of developing asthma by age 7 years</td>
</tr>
<tr>
<td>7</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>32%</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>40%</td>
<td><strong>HIGH RISK</strong></td>
</tr>
<tr>
<td>10</td>
<td>49%</td>
<td>Children with these scores have a 2 in 5 [Score of 9] to a 4 in 5 [Score of 14] risk of developing asthma by age 7 years</td>
</tr>
<tr>
<td>11</td>
<td>58%</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>66%</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>79%</td>
<td></td>
</tr>
</tbody>
</table>

2018 American Academy of Allergy, Asthma & Immunology https://doi.org/10.1016/j.jaci.2018.09.037
Core Components of Asthma Care

Goal of Asthma Therapy: Achieve Control

Reduce Impairment
- Prevent chronic and troublesome symptoms
- Require infrequent use of inhaled SABA (≤2 days/week)
- Maintain (near) “normal” pulmonary function
- Maintain normal activity levels
- Meet patients’ expectations of, and satisfaction with, asthma care

Reduce Risk
- Prevent recurrent exacerbations
- Minimize need for emergency department visits or hospitalizations
- Prevent progressive loss of lung function
- Provide optimal pharmacotherapy, with minimal or no adverse effects

Asthma may be uncontrolled if patients report that . . .

• They are using a quick-relief inhaler more than 2 times per week
• They awaken at night due to asthma symptoms more than 2 times per month
• They refill a quick-relief inhaler prescription more than 2 times per year

“Rules of Two” is a trademark of the Baylor Health Care System.
Childhood Asthma Control Test
Questions Completed by Child Age 4-11 Years

1. How is your asthma today?
   - 0 Very bad
   - 1 Bad
   - 2 Good
   - 3 Very Good

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

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

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

SCORE
5. During the last 4 weeks, on average, how many days per month did your child have any daytime asthma symptoms?

<table>
<thead>
<tr>
<th>Days per month</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>5</td>
</tr>
<tr>
<td>1-3 days/mo</td>
<td>4</td>
</tr>
<tr>
<td>4-10 days/mo</td>
<td>3</td>
</tr>
<tr>
<td>11-18 days/mo</td>
<td>2</td>
</tr>
<tr>
<td>19-24 days/mo</td>
<td>1</td>
</tr>
<tr>
<td>Everyday</td>
<td>0</td>
</tr>
</tbody>
</table>

6. During the last 4 weeks, on average, how many days per month did your child wheeze during the day because of asthma?

<table>
<thead>
<tr>
<th>Days per month</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
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<td>2</td>
</tr>
<tr>
<td>19-24 days/mo</td>
<td>1</td>
</tr>
<tr>
<td>Everyday</td>
<td>0</td>
</tr>
</tbody>
</table>

7. During the last 4 weeks, on average, how many days per month did your child wake up during the night because of asthma?

<table>
<thead>
<tr>
<th>Days per month</th>
<th>Number of Responses</th>
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</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>5</td>
</tr>
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<td>1-3 days/mo</td>
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</tr>
<tr>
<td>11-18 days/mo</td>
<td>2</td>
</tr>
<tr>
<td>19-24 days/mo</td>
<td>1</td>
</tr>
<tr>
<td>Everyday</td>
<td>0</td>
</tr>
</tbody>
</table>

TOTAL
Asthma Control Test (ACT)

1. In the past 4 weeks, how much of the time did your asthma keep you from getting as much done at work, school or at home?

   - All of the time 1
   - Most of the time 2
   - Some of the time 3
   - A little of the time 4
   - None of the time 5

2. During the past 4 weeks, how often have you had shortness of breath?

   - More than once a day 1
   - Once a day 2
   - 3 to 6 times a week 3
   - Once or twice a week 4
   - Not at all 5

3. During the past 4 weeks, how often did your asthma symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night, or earlier than usual in the morning?

   - 4 or more nights a week 1
   - 2 or 3 nights a week 2
   - Once a week 3
   - Once or twice 4
   - Not at all 5

4. During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?

   - 3 or more times per day 1
   - 1 or 2 times per day 2
   - 2 or 3 times per week 3
   - Once a week or less 4
   - Not at all 5

5. How would you rate your asthma control during the past 4 weeks?

   - Not controlled at all 1
   - Poorly controlled 2
   - Somewhat controlled 3
   - Well controlled 4
   - Completely controlled 5

Asthma Control Test™ is a trademark of QualityMetric Incorporated.
Scoring the ACT/C-ACT

• 19 or less: Your asthma may not be under control.
  – Make an appointment to discuss your Asthma Control Test score.
• 20 or more: Your asthma seems to be well controlled.

www.asthmacontrol.com
Stepwise Approach for Managing Asthma in Children Aged 0 to 4 Years

**Interventions**

<table>
<thead>
<tr>
<th>Step</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Preferred: SABA PRN</td>
</tr>
</tbody>
</table>
| **Step 2** | Preferred: Low-dose ICS (A)  
Alternative: Cromolyn (B) or Montelukast (A) |
| **Step 3** | Preferred: Medium-dose ICS + either LABA (D) or Montelukast (D)           |
| **Step 4** | Preferred: Medium-dose ICS + either LABA (D) or Montelukast (D)           |
| **Step 5** | Preferred: High-dose ICS + either LABA or Montelukast and Oral Systemic Corticosteroids (D) |
| **Step 6** | Preferred: High-dose ICS + either LABA or Montelukast and Oral Systemic Corticosteroids (D) |

**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

**Assess Control**

- Step **Up If Needed**
  - (first, check adherence, inhaler technique, and environmental control)

- Step **Down If Possible**
  - (and asthma is well controlled at least 3 months)

## Stepwise Approach for Managing Asthma in Children Aged 5 to 11 Years

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

### Persistent Asthma: Daily Medication

#### Step 1: Preferred
- SABA PRN

#### Step 2: Preferred
- Low-dose ICS (A)
- Alternative: Cromolyn (B), LTRA (B), Nedocromil (B), or Theophylline (B)

#### Step 3: Preferred
- Low-dose ICS + either LABA (B), LTRA (B), or Theophylline (B)
- OR Medium-dose ICS (B)

#### Step 4: Preferred
- Medium-dose ICS + LABA (B)
- OR High-dose ICS + either LTRA (B) or Theophylline (B)

#### Step 5: Preferred
- High-dose ICS + LABA (B)
- OR Medium-dose ICS + either LTRA (B) or Theophylline (B)

#### Step 6: Preferred
- High-dose ICS + LABA + Oral Systemic Corticosteroid (D)
- OR High-dose ICS + either LTRA or Theophylline and Oral Systemic Corticosteroid (D)

### 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 of use of SABA or use >2 days a week for symptom relief (not prevention of EIB) indicates inadequate control and the need to step up treatment

### Assess Control

- Step Up If Needed (first, check adherence, inhaler technique, environmental control, and comorbid conditions)
- Step Down If Possible (and asthma is well-controlled at least 3 months)

---

### Stepwise Approach for Managing Asthma in Patients Aged ≥12 Years

<table>
<thead>
<tr>
<th>Intermittent Asthma</th>
<th>Persistent Asthma: Daily Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consult with asthma specialist if Step 4 care or higher is required. Consider consultation at Step 3.</td>
<td></td>
</tr>
</tbody>
</table>

#### Step 1
**Preferred:** SABA PRN
**Alternative:** Cromolyn (A), LTRA (A), Nedocromil (A), or Theophylline (B)

#### Step 2
**Preferred:** Low-dose ICS (A)
**Alternative:** Medium-dose ICS + LABA (B)

#### Step 3
**Preferred:** Low-dose ICS + LABA (A)
**Alternative:** Medium-dose ICS + either LTRA (A), Theophylline (B), or Zileuton (D)

#### Step 4
**Preferred:** Medium-dose ICS + LABA (B)
**Alternative:** Low-dose ICS + either LTRA (A), Theophylline (B), or Zileuton (D)

#### Step 5
**Preferred:** High-dose ICS + LABA (B)
**Alternative:** Consider Omalizumab for Patients Who Have Allergies (B)

#### Step 6
**Preferred:** High-dose ICS + LABA + Oral Corticosteroid AND Consider Omalizumab for Patients Who Have Allergies (B)

---

**ICS = inhaled corticosteroids; LABA = long-acting β₂-agonist; LTRA = leukotriene receptor antagonist.**


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### 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 systemic oral 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

---

### Assess Control

**Step Up If Needed** (first, check adherence, environmental control, and comorbid conditions)

**Step Down If Possible** (and asthma is well controlled at least 3 months)

---

Each Step: Patient education, environmental control, and management of comorbidities

Steps 2-4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma
### Assessing Asthma Control and Adjusting Therapy in Youths ≥12 Years of Age and Adults

#### Components of Control

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Well Controlled</th>
<th>Not Well Controlled</th>
<th>Very Poorly Controlled</th>
</tr>
</thead>
<tbody>
<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>SABA 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></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATAQ</td>
<td>0</td>
<td>1-2</td>
<td>3-4</td>
</tr>
<tr>
<td>ACQ</td>
<td>≤0.75</td>
<td>≥1.5</td>
<td>N/A</td>
</tr>
<tr>
<td>ACT</td>
<td>≥20</td>
<td>16-19</td>
<td>≤15</td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0-1/year</td>
<td>≥2/year</td>
<td>Consider severity and interval since last exacerbation</td>
</tr>
<tr>
<td>Progressive loss of lung function</td>
<td>Evaluation requires long-term follow-up</td>
<td></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>
<td></td>
</tr>
</tbody>
</table>

#### Recommended Action for Treatment

- Maintain current step
- Regular follow-ups 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 to 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

---

Exacerbations (consider frequency and severity)

Classifying Asthma Severity and Initiating Treatment in Youths ≥12 Years of Age and Adults

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Intermittent</th>
<th>Persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mild</td>
</tr>
<tr>
<td>Frequency and severity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥2 occurrences/year</td>
<td>Daily</td>
<td>Throughout the day</td>
</tr>
<tr>
<td>≤2 occurrences/year</td>
<td>&gt;2 occurrences/year but not daily</td>
<td>Daily</td>
</tr>
</tbody>
</table>

### Impairment

<table>
<thead>
<tr>
<th>Normal FEV₁/FVC:</th>
<th>Persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-19 yr 85%</td>
<td></td>
</tr>
<tr>
<td>20-39 yr 80%</td>
<td></td>
</tr>
<tr>
<td>40-59 yr 75%</td>
<td></td>
</tr>
<tr>
<td>60-80 yr 70%</td>
<td></td>
</tr>
</tbody>
</table>

### Risk

<table>
<thead>
<tr>
<th>Exacerbations</th>
<th>Relative annual risk of exacerbations may be related to FEV₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2/year</td>
<td>Frequency and severity may fluctuate over time for patients in any severity category</td>
</tr>
<tr>
<td>&gt;2/year</td>
<td></td>
</tr>
</tbody>
</table>

### Recommended Step for Initiating Treatment

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3 and consider short course of systemic oral corticosteroids</th>
<th>Step 4 or 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 2 to 6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| EIB = exercise-induced bronchoconstrictions; FEV₁ = forced expiratory volume in one second; FVC = forced vital capacity. |
Overview of Asthma Medications

**Long-Term Control**
- Corticosteroids (inhaled)
- Long-acting beta$_2$-agonists
- Leukotriene modifiers
- Cromolyn/nedocromil
- Methylxanthines
- Anti-IgE therapy
- Monoclonal Antibiotics
- Long-acting anticholinergic

**Quick Relief**
- Short-acting inhaled beta$_2$-agonists
- Anticholinergics
- Systemic corticosteroids
Why Use Combination (ICS + LABA) Therapy?

Low-dose ICS + LABA vs. comparator results in:

- ↑ Lung function
- ↓ Symptoms
- ↓ Exacerbations
- ↓ Albuterol use
- Reduced need to increase ICS dose

Replicated numerous times by other investigators.

Nelson et al *J Allergy Clin Immunology*. 2000;106:1088-1095
Role of Inhaled Corticosteroids in Persistent Asthma

• NIH Asthma Guidelines state: ICS are the most potent and effective long-term control medication*

• Clinical effects of ICS:
  – Reduce asthma symptom severity
  – Reduce need for quick-relief medications
  – Improve peak flow, FEV$_1$, and airway hyperresponsiveness

• Patients may relapse when ICS are discontinued

Corticosteroids for Asthma: Benefits and Risks

Benefits
- Reduces inflammation
- Most effective long-term control medication for asthma*
- Decreases morbidity / mortality

Risks
- Dose, drug, & route dependent
- Generally known and can be monitored

Pediatric Asthma Guidelines*

*Goals of Asthma Therapy*

• Minimal – ideally NO – symptoms during the day or night
• Minimal – ideally NO – asthma episodes
• Minimal use (<1x/day) of short-acting beta-agonist
• PEF ≥ 80% of personal best (if used)
• Minimal – ideally NO – adverse effects from medications
• NORMAL ACTIVITIES

* American Academy of Allergy, Asthma & Immunology; American Academy of Pediatrics; NAEPP / NHLBI / NIH.
Realities of Asthma

• The goals of asthma therapy have not been adequately realized
• For most asthma patients and parents, the burden of asthma is significant
• **Asthma is not consistently diagnosed, classified and assessed correctly**
• Parents and patients do not have a good feel for their asthma
• **Asthma is variable and unpredictable**
• Mild asthma is a very serious disease with very serious consequences
• **Inhaled steroids are the first-line treatment of choice for mild persistent asthma**