Session 4: The New Guidelines as a Tool for Managing Asthma in Clinical Practice: Controlling Disease in Heterogeneous Populations

Learning Objectives

- Describe 3 major indicators of impairment and/or risk that aid in determining the degree of asthma control.
- Identify 2 “step up” combination controller therapies to consider for patients who continue to have asthma symptoms on monotherapy.

Faculty

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University of Colorado School of Medicine
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Dr Andy Liu is an associate professor in pediatric allergy and immunology at the National Jewish Medical and Research Center and the University of Colorado School of Medicine. Dr Liu is a National Institutes of Health–sponsored researcher of the development and optimal management of asthma and allergies in childhood. He has teaching clinics in Pediatric Asthma and Allergy at National Jewish, Denver Health, and The Children’s Hospital in Denver. His recent publications include chapters for the new editions of *Nelson’s Textbook of Pediatrics* on childhood asthma as well as recent chapters and articles on asthma in the inner city, the development and natural history of asthma and allergic diseases in childhood, optimizing assessments for children with asthma, early intervention, hygiene theory, and endotoxin. He has written articles for the *Lancet, Journal of Allergy and Clinical Immunology, Journal of Experimental Medicine*, and *Proceedings of the National Academy of Sciences*.

Dr Liu received his undergraduate degree from Harvard College and his medical degree from the University of Massachusetts. He completed his pediatrics internship and residency at the University of Colorado, and his fellowships in allergy and immunology and in clinical and laboratory immunology at National Jewish. He was also the Training Program Director for National Jewish’s Allergy and Immunology Fellowship program for Pediatricians from 1995 – 2005.

Faculty Financial Disclosure Statement

The presenting faculty reported the following:

Dr Liu is on the speaker’s bureau for AstraZeneca LP, GlaxoSmithKline, and Merck & Co., Inc. He is on the advisory board for AstraZeneca LP and GlaxoSmithKline.

Education Partner Financial Disclosure Statement

The content collaborators at Med Learning Group have reported the following:

Tara Hun-Dorris, medical writer, consults for UCB Group, Inc. He is on the advisory board for AstraZeneca LP and GlaxoSmithKline.

Drug List

<table>
<thead>
<tr>
<th>Generic</th>
<th>Trade</th>
<th>Generic</th>
<th>Trade</th>
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</thead>
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<tr>
<td>albuterol</td>
<td>Proventil, Ventolin,</td>
<td>fluticasone</td>
<td>Flovent</td>
</tr>
<tr>
<td>beclomethasone dipropionate</td>
<td>AccuNeb, Beconase, Vancenase</td>
<td>fluticasone/salmeterol</td>
<td>Advair</td>
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<td>cimetidine</td>
<td>Tagamet</td>
<td>formoterol</td>
<td>Foradil</td>
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<td>cromolyn sodium</td>
<td>Intal</td>
<td>lansoprazole</td>
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<td>famotidine</td>
<td>Pepcid</td>
<td>levalbuterol</td>
<td>Xopenex</td>
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<td>montelukast</td>
<td>Singulair</td>
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<td>budesonide</td>
<td>Pulmicort</td>
<td>nedocromil sodium</td>
<td>Tilade</td>
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<td>flunisolide</td>
<td>Aerobid</td>
<td>omalizumab</td>
<td>Xolair</td>
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<td></td>
<td></td>
<td>omeprazole</td>
<td>Prilosec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pantoprazole</td>
<td>Protonix</td>
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Generic | Trade | Generic | Trade
---|---|---|---
pirbuterol | Maxair | theophylline | Uniphyll, Quibron,
prednisolone | Ora Pred, Prelone | triamcinolone | Theo-24
prednisone | various | zafirlukast | Aristocort,
rabeprazole | Aciphex | zileuton | Azmacort
ranitidine | Zantac | salmeterol | Accolate
salmeterol | Serevent | theophylline | Zyflo

**Acronym List**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACQ</td>
<td>Asthma Control Questionnaire</td>
<td>HR CT</td>
<td>high-resolution computed tomography</td>
</tr>
<tr>
<td>ACT</td>
<td>Asthma Control Test</td>
<td>ICS</td>
<td>inhaled corticosteroid</td>
</tr>
<tr>
<td>ATAQ</td>
<td>Asthma Therapy Assessment Questionnaire</td>
<td>ICU</td>
<td>intensive care unit</td>
</tr>
<tr>
<td>BHR</td>
<td>bronchial hyperresponsiveness</td>
<td>LABA</td>
<td>long-acting beta-agonist</td>
</tr>
<tr>
<td>ED</td>
<td>emergency department</td>
<td>LTRA</td>
<td>leukotriene receptor antagonist</td>
</tr>
<tr>
<td>EIB</td>
<td>exercise-induced bronchospasm</td>
<td>NAEP</td>
<td>National Asthma Education and Prevention Program</td>
</tr>
<tr>
<td>EPR</td>
<td>Expert Panel Report</td>
<td>NHLBI</td>
<td>National Heart, Lung and Blood Institute</td>
</tr>
<tr>
<td>FEV&lt;sub&gt;1&lt;/sub&gt;</td>
<td>forced expiratory volume in 1 second</td>
<td>NIH</td>
<td>National Institutes of Health</td>
</tr>
<tr>
<td>FVC</td>
<td>forced vital capacity</td>
<td>PEF</td>
<td>peak expiratory flow</td>
</tr>
<tr>
<td>GERD</td>
<td>gastrointestinal reflux disease</td>
<td>PI</td>
<td>pixel index</td>
</tr>
<tr>
<td>GINA</td>
<td>Global Initiative for Asthma Control</td>
<td>RV</td>
<td>residual volume</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOB</td>
<td>shortness of breath</td>
</tr>
</tbody>
</table>

**Suggested Reading List**


### Assessing Asthma Control (≥12 Years of Age)

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Well Controlled</th>
<th>Not Well Controlled</th>
<th>Very Poorly Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impairment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/wk</td>
<td>&gt;2 days/wk</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</td>
<td>Extreme</td>
</tr>
<tr>
<td>SABA use for symptom control*</td>
<td>≤2 days/wk</td>
<td>&gt;2 days/wk</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>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>Risk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exacerbations</td>
<td>0-1x year</td>
<td>≥2x year</td>
<td></td>
</tr>
<tr>
<td>Consider severity and interval since last exacerbation</td>
<td>Evaluation requires long-term follow up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progressive loss of lung function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Determining Asthma Severity (≥12 Years of Age)

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Intermittent</th>
<th>Persistent</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impairment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/wk</td>
<td>&gt;2 days/wk, not daily</td>
<td>Throughout the day</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2x month</td>
<td>3-4x month</td>
<td>&gt;1x week, not nightly</td>
</tr>
<tr>
<td>SABA use for symptom control*</td>
<td>≤2 days/wk</td>
<td>&gt;2 days/wk, not daily</td>
<td>Daily</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor</td>
<td>Some</td>
</tr>
<tr>
<td>Lung function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal FEV₁ between exacerbations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEV₁ &gt;80% predicted FEV₁/FVC normal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEV₁ &gt;60%, FEV₁/FVC reduced 5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEV₁ &lt;60% predicted FEV₁/FVC reduced &gt;5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk</td>
<td>0-1x year</td>
<td>≥2 in 1 year</td>
<td></td>
</tr>
<tr>
<td>Consider severity and interval since last exacerbation</td>
<td>Frequency and severity may fluctuate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative annual risk may be related to FEV₁</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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2007 NAEPP Asthma Management Guidelines for Adolescents and Adults

*Not for prevention of EIB; FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity; ATAQ, Asthma Therapy Assessment Questionnaire; ACQ, Asthma Control Questionnaire; ACT, Asthma Control Test.

Stepwise Treatment Approach (≥12 Years of Age)

Intermittent Persistent asthma: daily medication (consult asthma specialist if ≥step 4 care required, consider consultation at step 3)

Step 6
High-dose ICS + LABA + oral systemic corticosteroid AND Consider omalizumab for patients with allergies

Step 5
High-dose ICS + LABA AND Consider omalizumab for patients with allergies

Step 4*
High-dose ICS + LABA AND Consider omalizumab for patients who have allergies

Step 3*
Medium-dose ICS + LABA

Step 2*
Low-dose ICS + LABA or medium-dose ICS

Alternative
Low-dose ICS + either LTRA, theophylline, or zileuton

Step 1
Low-dose ICS

Alternative
Cromolyn, LTRA, nedocromil, or theophylline

SABA PRN

Patient education and environmental control at each step

Managing Exacerbations by Severity

<table>
<thead>
<tr>
<th>Signs and Symptoms</th>
<th>Initial Peak Expiratory Flow (PEF) (or FEV₁)</th>
<th>Clinical Course</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mild</strong></td>
<td>Dyspnea only with activity (assess tachypnea in young children)</td>
<td>PEF ≥70% predicted or personal best</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>Dyspnea interferes with or limits usual activity</td>
<td>PEF 40-69% predicted or personal best</td>
</tr>
<tr>
<td><strong>Severe</strong></td>
<td>Dyspnea at rest; interferes with conversation</td>
<td>PEF &lt;40% predicted or personal best</td>
</tr>
<tr>
<td><strong>Life threatening</strong></td>
<td>Too dyspneic to speak; perspiring</td>
<td>PEF &lt;25% predicted or personal best</td>
</tr>
</tbody>
</table>

New National Guidelines as a Tool for Managing Asthma in Clinical Practice

Asthma’s Impact on Society

- 20 million Americans have asthma, including 9 million children
- Every day, asthma is responsible for:
  - 40,000 missed work and school days
  - 30,000 exacerbations
  - 5000 emergency department (ED) visits
  - 1000 hospital admissions
  - 11 deaths
- Annual costs:
  - Direct health care >$10 billion
  - Indirect health care $8 billion
  - Prescription drugs $5 billion

What is Asthma?

Clinical Symptoms:
- Intermittent symptoms
  - Cough
  - Wheeze
  - Shortness of breath
  - Chest pain
  - Rescue medication use
  - Diurnal variation
  - Varying triggers
- Exacerbations

Biological Indicators:
- Bronchiolar obstruction
- Airway smooth muscle bronchoconstriction
- Airways inflammation (eosinophilic)
- Bronchial hyperresponsiveness (BHR)
- Airway remodeling

Diagnosing Asthma

What to Look For:
- Episodic symptoms of airflow obstruction and BHR
- Airflow obstruction is at least partially reversible
- Alternative diagnoses are excluded

How to Assess:
- Detailed medical history
- Physical examination (focus on upper respiratory tract, chest, skin)
- Spirometry to demonstrate obstruction and assess reversibility (>4 years of age)
- Additional studies as necessary

Airway Remodeling in a Child with Severe Asthma

Airway Obstruction in Asthma

Reversible:
- Bronchoconstriction
- Excess mucous secretion
- Tissue edema
- Inflammatory infiltrate and exudate (eosinophilic)
- Airway lining damage
- BHR

Irreversible:
- Smooth muscle hypertrophy and hyperplasia
- Mucous gland hypertrophy and hyperplasia
- Airway wall thickening, narrowing
- Loss of tethering, airways closure
- Hypervascularity
- Neural proliferation
- Lung growth and development
Heterogeneity in Asthma

- Different patterns of wheezing:
  - Early childhood
  - Adulthood
- Differ by:
  - Onset
  - Prognosis for persistence
- Patterns of persistence develop in early life:
  - Lung dysfunction
  - Atopy

Tucson Children’s Respiratory Study (N=826): Asthma & Wheeze in the First 6 Years of Life

- Transient: wheeze <3 years old; no wheeze at 6 years old
- Persistent: wheeze <3 years old; wheeze at 6 years old
- Late: no wheeze <3 years old; wheeze at 6 years old
- Never wheezed by age 6 years

Early Atopy Equates to Persistent Asthma

- Atopic (n=94)
- Non-atopic (n=59)

NAEPP Asthma Management Guidelines: Four Components of Asthma Management

- Measures of assessment and monitoring
- Education for a partnership in asthma care
- Control of environmental factors and comorbid conditions that affect asthma
- Pharmacologic therapy

NAEPP 2007: Severity & Control

- Classify disease severity to initiate therapy
- Assess control for monitoring and adjusting therapy
- Asthma severity and control are defined in terms of:
  - Impairment
  - Risk

NAEPP 2007: Impairment & Risk

Impairment:
- Symptoms
  - Day symptoms
  - Nighttime awakenings
  - Rescue SABA use
  - Activity limitation
- Low lung function

Risk:
- Exacerbations
- Medication adverse effects
- Persistent low lung function

NAEPP 2007: Severity & Control

NAEPP 2007: Impairment & Risk
NAEPP Asthma Severity
(0-4 Years of Age)

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Intermittent</th>
<th>Persistent</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic</td>
<td>2 x day</td>
<td>≥2 days/wk</td>
<td>Daily</td>
<td>Throughout the day</td>
<td></td>
</tr>
<tr>
<td>Nighttime awakening</td>
<td>0</td>
<td>≥3 days/week</td>
<td>None</td>
<td>Some</td>
<td></td>
</tr>
<tr>
<td>Symptomatic symptom onset</td>
<td>62 days/week</td>
<td>≥2 days/week</td>
<td>Daily</td>
<td>Several times per day</td>
<td></td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor</td>
<td>Some</td>
<td>Extreme</td>
<td></td>
</tr>
</tbody>
</table>

Risk
- Exacerbations requiring oral systemic corticosteroids: 0.1% year
- ≥2 in 6 months requiring oral corticosteroids in 1 year lasting >4 days and not factors for persistent asthma
- Consider severity and interval since last exacerbation
- Frequency and severity may fluctuate
- Exacerbations of any severity may occur


Assessing Asthma Control
(0-4 Years of Age)

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Well Controlled</th>
<th>Not Well Controlled</th>
<th>Very Poorly Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic</td>
<td>0 day</td>
<td>≥2 days/week</td>
<td>Throughout the day</td>
</tr>
<tr>
<td>Nighttime awakening</td>
<td>0 week</td>
<td>&gt;3 days/week</td>
<td>Extreme</td>
</tr>
<tr>
<td>Symptomatic symptom onset</td>
<td>62 days/week</td>
<td>≥2 days/week</td>
<td>Daily</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor</td>
<td>Some</td>
</tr>
</tbody>
</table>

Risk
- Exacerbations: 0.1% year
- ≥2 in 6 months requiring oral systemic corticosteroids
- Treatment-related adverse effects can vary in intensity from none to very uncomfortable or serious. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk

Assessing Asthma Control
(5-11 Years of Age)

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Well Controlled</th>
<th>Not Well Controlled</th>
<th>Very Poorly Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic</td>
<td>0 day</td>
<td>≥2 days/week</td>
<td>Throughout the day</td>
</tr>
<tr>
<td>Nighttime awakening</td>
<td>0 week</td>
<td>&gt;3 days/week</td>
<td>Extreme</td>
</tr>
<tr>
<td>Symptomatic symptom onset</td>
<td>62 days/week</td>
<td>≥2 days/week</td>
<td>Daily</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor</td>
<td>Some</td>
</tr>
</tbody>
</table>

Risk
- Exacerbations: 0.1% year
- ≥2 in 6 months requiring oral systemic corticosteroids
- Treatment-related adverse effects can vary in intensity from none to very uncomfortable or serious. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk

Assessing Asthma Control
(12 Years of Age and Older)

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Well Controlled</th>
<th>Not Well Controlled</th>
<th>Very Poorly Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic</td>
<td>0 day</td>
<td>≥2 days/week</td>
<td>Throughout the day</td>
</tr>
<tr>
<td>Nighttime awakening</td>
<td>0 week</td>
<td>&gt;3 days/week</td>
<td>Extreme</td>
</tr>
<tr>
<td>Symptomatic symptom onset</td>
<td>62 days/week</td>
<td>≥2 days/week</td>
<td>Daily</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor</td>
<td>Some</td>
</tr>
</tbody>
</table>

Risk
- Exacerbations: 0.1% year
- ≥2 in 6 months requiring oral systemic corticosteroids
- Treatment-related adverse effects can vary in intensity from none to very uncomfortable or serious. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk


Validated Tools for Assessment & Monitoring

- Asthma Control Questionnaire
- Asthma Therapy Assessment Questionnaire
- Asthma Control Test
- Asthma Control score


Asthma Control Test

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

2. During the past 4 weeks, how often did your asthma symptoms wake you up at night or earlier than usual in the morning?
   - None of the time
   - Some of the time
   - Most of the time
   - All of the time

3. During the past 4 weeks, how often did you use your rescue inhaler or metered-dose inhaler?
   - None of the time
   - Some of the time
   - Most of the time
   - All of the time

4. During the past 4 weeks, how often did you have any occasions where you had SOB, chest tightness, or pain?
   - None of the time
   - Some of the time
   - Most of the time
   - All of the time

5. How would you rate your asthma control during the past 4 weeks?
   - Completely controlled
   - Fairly well controlled
   - Not well controlled
   - Completely uncontrolled

Which of the following indicates that asthma is controlled?

1. Nocturnal symptoms or awakenings due to asthma ≤1 time per month
2. Nocturnal symptoms or awakenings due to asthma ≤1 time per week
3. Nocturnal symptoms or awakenings due to asthma ≤1 time per day
4. None of the above

Asthma Control score

Validated Tools for Assessment & Monitoring

Stepwise Treatment Approach (0-4 Years of Age)

- Patient education and environmental control at each step

Stepwise Treatment Approach (5-11 Years of Age)

- Patient education and environmental control at each step

*Consider subcutaneous allergen immunotherapy for patients who have allergic asthma.
**Stepwise Treatment Approach (≥12 Years of Age)**

1. **Intermediate**: Persistent asthma: daily medication (consult asthma specialist if more than 4 care required, consider consultation at step 2)
2. **Step 1**: Low-dose ICS + LABA (if needed)
3. **Step 2**: Moderate-low ICS + LABA
4. **Step 3**: Moderate-high ICS + LABA
5. **Step 4**: High-dose ICS + LABA
6. **Step 5**: High-dose ICS + LABA + oral corticosteroid

**Changing Roles of Asthma Therapies**

- **LABAs**
  - Black box warning: may increase the risk of asthma-related exacerbations and deaths.
  - Should only be prescribed for patients not adequately controlled on other medications or whose disease severity warrants initiation of treatment with 2 maintenance therapies.
  - For patients ≥12 years of age not adequately controlled on low-dose ICS, the option of increasing to medium-dose ICS should be given equal weight to ICS + LABA.
  - LABAs have proven efficacy when used with an appropriate dose of ICS.

- **Cromones**
  - Not among recommended Global Initiative for Asthma (GINA) asthma treatments, but still recommended by NAEPPI.

**ICS Efficacy, Safety, & Limitations**

- **Efficacy**
  - Reduced asthma symptoms, improved quality of life, improved lung function, decreased airway hyperresponsiveness, controlled airway inflammation, reduced frequency and severity of exacerbations, reduced asthma mortality.

- **Side effects**
  - Long-term treatment with high doses: easy bruising, adrenal suppression.
  - In children: small, possibly transient reductions in growth velocity.

- **Limitations**
  - Do not affect long-term airway remodeling.
  - Do not increase likelihood of losing asthma control.

**Periodically Assess & Monitor Patients for Asthma Control**

- **Goal is to reduce impairment and risk**
- **Periodic assessments (1- to 6-month intervals)** and ongoing monitoring of asthma control are recommended to determine if the goals of therapy are being met and if adjustments in therapy are needed.
- **Clinician assessment and patient self-assessment** are the primary methods for monitoring asthma.

**Achieving & Maintaining Asthma Control: Breathmobile Program, L.A. County**

- **The program**: “Breathmobile” went to Los Angeles county medical centers and schools to offer ongoing care to urban children with asthma (ages 3 to 18 years at enrollment) of lower socioeconomic status.
- **Objective**: Does regular participation in a disease-management program that provides NAEPPI guidelines-based care help children achieve and maintain asthma control?
- **Primary measure**: Clinical construct of asthma control based on the NAEPPI goals of asthma therapy.
- **Enrollment**: 2185 patients entered the program and 1991 patients received subsequent control maintenance.
Baseline Asthma Severity Rating:

<table>
<thead>
<tr>
<th>Control at Visit</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>10%</td>
</tr>
<tr>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>90%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Breathmobile Program, L.A. County

Adherence:

- Asthma in Pregnancy
- Exercise-induced Bronchospasm (EIB)
- Common Co-Morbidities:
  - Rhinitis
  - Gastroesophageal reflux (GERD)
  - Smoking
- Asthma in Pregnancy

Controller Adherence Affects Patient Safety

- Exacerbation
- No Exacerbation

Mean Compliance with ICS

Adherence to ICS and SABA was monitored in 24 children ages 6 to 12 years with asthma for 15 weeks.


Mean Weekly Hospitalizations, N

- Asthma Hospitalizations in Canada

20% to 25% of all hospitalizations for asthma exacerbations in children occur in September

### School-age Children Are Vectors for Viral Infections that Exacerbate Asthma

- Canadian schools start the day after Labor Day; in school-age children, peak asthma hospitalizations occur 17.7 days after Labor Day (p<0.001).
- In pre-school children, 1.7 days later (p<0.05).
- In adults, 6.3 days later.
- Magnitude of peak:
  - Rises: 1 to 7 years old
  - Declines: 7 to 18 years old
  - Plateaus: 19 to 50 years old

### Risk Factors for Hospital Admission for Asthma: Manchester, UK

<table>
<thead>
<tr>
<th>Description</th>
<th>Asthma Hospital Admissions (%)</th>
<th>Odds Ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitized only</td>
<td>96</td>
<td>1.75</td>
<td>0.56</td>
</tr>
<tr>
<td>Virus detected*</td>
<td>44</td>
<td>3.2</td>
<td>0.23</td>
</tr>
<tr>
<td>Sensitized + exposed</td>
<td>78</td>
<td>2.6</td>
<td>0.13</td>
</tr>
<tr>
<td>Sensitized + virus</td>
<td>Not done</td>
<td>8.9</td>
<td>0.25</td>
</tr>
<tr>
<td>Sensitized + exposed + virus*</td>
<td>35</td>
<td>19.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>On ICS</td>
<td>62</td>
<td>0.3</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Study of hospitalized children 3-17 years of age admitted during a 1-year period. *83% rhinovirus.


### Risk Factors for ED Visits for Asthma: Ontario, Canada

<table>
<thead>
<tr>
<th>Description</th>
<th>ER Cases</th>
<th>Controls</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥1 Positive skin test</td>
<td>63%</td>
<td>39%</td>
<td>0.01</td>
</tr>
<tr>
<td>Virus detected*</td>
<td>62%</td>
<td>41%</td>
<td>0.01</td>
</tr>
<tr>
<td>Sensitized</td>
<td>75%</td>
<td>94%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Virus detected*</td>
<td>49%</td>
<td>85%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LTRA</td>
<td>9%</td>
<td>20%</td>
<td>0.04</td>
</tr>
<tr>
<td>Mite-proof mattress cover</td>
<td>2%</td>
<td>20%</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Children with asthma (ER cases) aged 5 to 15 years presenting to ED with asthma in 2 Canadian communities from September 19-30, 2001. *84% rhinovirus.


### NAEPP: Managing Exacerbations by Severity

<table>
<thead>
<tr>
<th>Severe Symptoms</th>
<th>Initial Peak Expiratory Flow (PEF) (FEV1) (%)</th>
<th>Clinical Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>SABAs prescribed at usual dose</td>
<td>- Promote early use of oral corticosteroids, intravenous corticosteroids, inhaled corticosteroids, and oral systemic corticosteroids.</td>
<td></td>
</tr>
<tr>
<td>LTRAs prescribed at usual dose</td>
<td>- Promote early use of oral corticosteroids, intravenous corticosteroids, inhaled corticosteroids, and oral systemic corticosteroids.</td>
<td></td>
</tr>
<tr>
<td>Mite-proof mattress cover</td>
<td>- Promote early use of oral corticosteroids, intravenous corticosteroids, inhaled corticosteroids, and oral systemic corticosteroids.</td>
<td></td>
</tr>
</tbody>
</table>

### Managing Exacerbations

- Defined as an acute or subacute episode of progressively worsening shortness of breath, cough, wheezing, and chest tightness—or some combination of these symptoms
- Primary therapies are SABAs, oral corticosteroids, oxygen
- Early treatment is the best management strategy
  - Patient education
  - Recognition of early signs of worsening
  - Removal of contributing environmental factors
  - Prompt communication

### Which of the following is not a risk factor for ER visits for asthma?

1. A positive allergy skin test
2. Presence of a virus, particularly rhinovirus
3. Prescribed an ICS
4. None of the above
**Pathology of Asthma**

Ventilation Defects in Peripheral Airways: HR CT Scan

Which of the following may be beneficial in the treatment of the peripheral airways?

1. Small particle ICS
2. Any ICS
3. Oral LTRA
4. 1 and 3 above
5. None of the above

Managing Exercise-Induced Bronchospasm

- EIB occurs in 90% of patients with asthma and >10% of the general population
- EIB often indicates poorly controlled asthma
- Pretreatment prior to exercise
  - SABAs, LABAs are effective in up to 80% of patients
  - LTRAs are effective in up to 50% of patients
- Encourage patients to warm up prior to exercise and consider wearing a mask or scarf in cold weather

Common Co-Morbidities That Make Asthma Worse

- Allergic rhinitis
  - 17% to 38% of patients with allergic rhinitis have asthma
  - 5% to 9% of general population has asthma
  - 65% to 80% of asthma patients have allergic rhinitis
  - 20% of general population has allergic rhinitis
- GERD
  - One-third of adults with asthma have GERD
  - 20% of general population has GERD
  - Patients with asthma are at a significantly increased risk of developing GERD
- Smoking
  - ~20% of patients with asthma are regular smokers; comparable to adult population (~22% are regular smokers)

Common Allergic Diseases in Childhood: The Allergic March

Asthma
Eczema
Food Allergy
Rhinitis

Which of the following upper airways treatments may also help with asthma symptoms?

1. Avoidance/environmental control
2. Treatment with an LTRA
3. Treatment with an antihistamine
4. All of the above

National Guidelines for Monitoring and Treating Asthma During Pregnancy

- Monthly evaluation of asthma history and pulmonary function
- Albuterol is preferred SABA
- ICSs are preferred controller treatment
  - Budesonide has most established safety profile
  - Cromolyn, LTRAs, and LABAs may be alternatives but have lower efficacy (cromolyn) or less safety data available (LTRAs, LABAs)
  - LABA should not be used as monotherapy
- Comorbid allergic rhinitis can be managed with intranasal corticosteroids, LTRAs, loratadine, or cetirizine

How frequently should asthma be monitored during pregnancy?

1. At the request of the patient’s OB-GYN
2. Weekly
3. Monthly
4. Every other month

Treating the Upper Airways Can Improve Asthma Symptoms

- Avoidance/environmental control is key treatment for both diseases
- Intranasal corticosteroids reduce both asthma and allergic rhinitis symptoms in patients with mild asthma
- Treatment with an antihistamine alone or in combination with a decongestant may reduce asthma and allergic rhinitis symptoms
- Cysteinyl leukotrienes are inflammatory mediators in both the upper and lower airways
- Leukotriene modifiers treat symptoms of asthma and allergic rhinitis
- Immunotherapy may reduce development of asthma in patients with seasonal rhinoconjunctivitis

Asthma During Pregnancy

- Cohort study followed 140,299 pregnancies in Tennessee Medicaid program from 1995 to 2003
- 23% of white women and 40% of black women had a hospitalization or ED visit during pregnancy
  - Black women were 1.6 (95% CI 1.5-1.7) times more likely than white women to receive care for an exacerbation
- 77% of women did not use asthma control medication
- Dose response trend (P<0.001) between lower birth weight and increasing use of oral corticosteroids
- Asthma prescriptions may not be prescribed or refilled during pregnancy

How frequently should asthma be monitored during pregnancy?

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2. Weekly
3. Monthly
4. Every other month

How frequently should asthma be monitored during pregnancy?

1. At the request of the patient’s OB-GYN
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Conclusions

• New national guidelines focus on assessing disease in terms of initial severity and then monitoring asthma control, encompassing the domains of risk and impairment
• Optimal management is individualized to each patient within the scope of the guidelines
• A guidelines-based approach can achieve and maintain good asthma control for the large majority of people with asthma