Asthma: Treatment principles

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Respiratory Institute

National Institutes of Health
National Asthma Education Prevention Program (NAEPP)

2007 Guidelines for the Diagnosis and Management of Asthma (EPR-3)

http://www.nhlbi.nih.gov/guidelines/asthma/index.htm
National Asthma Education and Prevention Program

- Treatment recommendations based on:
  - Severity
  - Control
  - Responsiveness

- Provide patient self-management education at multiple points of care

- Reduce exposure to inhaled indoor allergens to control asthma-multifaceted approach

Managing Asthma: Asthma Management Goals

- Achieve and maintain control of symptoms
- Maintain normal activity levels, including exercise
- Maintain pulmonary function as close to normal levels as possible
- Prevent asthma exacerbations
- Avoid adverse effects from asthma medications
- Prevent asthma mortality
Important Points to take into account in asthma treatments

1. The key elements of assessment and monitoring are severity, control, and responsiveness to treatment.
2. Appropriate asthma management requires the proper use of long term control and quick relief medications.
3. Because asthma symptoms are variable, patients (and families) need to recognize symptoms and adjust medications at home according to the clinician’s assessment of control and his/her (written) action plan for the patient.
4. Good communication between patient and clinician helps identify patient concerns, makes patient teaching more effective and promotes patient self-confidence to follow the treatment plan.
5. Patient education can be efficiently and effectively accomplished in several standard primary care visits.

Source: PACE, Physician Asthma Care education

Asthma Management: Six Key Messages

• Inhaled Corticosteroids
• Asthma Action Plan
• Asthma Severity
• Asthma Control
• Follow-up Visits
• Allergen and Irritant Exposure Control
Asthma Management: Two Categories of Medications

• Long-term control: (remember inflammation)
  – Taken daily over a long period of time
  – Used to reduce inflammation, relax airway muscles, and improve symptoms and lung function
  – Inhaled corticosteroids
  – Leukotriene modifiers

• Quick relief
  – Used in acute episodes
  – Generally short-acting beta2agonists

The 4 Components of Asthma Management

• Component 1:
  – Measures of Asthma Assessment and Monitoring

• Component 2:
  – Education

• Component 3:
  – Control of Environmental Factors and Co-morbidities

• Component 4:
  – Medications
1: Measures of Asthma Assessment & Monitoring

Assessment and monitoring are closely linked to the concepts of severity, control, and responsiveness to treatment:

- **Severity** - intensity of the disease process. Severity is measured most easily and directly in a patient not receiving long-term-control therapy.

- **Control** - degree to which asthma (symptoms, functional impairments, and risks of untoward events) are minimized and the goals of therapy are met.

- **Responsiveness** - the ease with which asthma control is achieved by therapy.

- **Impairment (Present):**
  - Frequency and intensity of symptoms
  - Functional limitations (quality of life)

- **Risk (Future):**
  - Likelihood of asthma exacerbations
  - Progressive loss of lung function
  - Risk of adverse effects from medication

- **Assess:** directed history, lung function, and Asthma Control Test (ACT)
  - Some patients appear to perceive the severity of airflow obstruction poorly.

### NOT Currently Taking Controllers

<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 Moderate Severe</td>
</tr>
<tr>
<td></td>
<td>Persistent</td>
</tr>
<tr>
<td>Impairment</td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week &gt;2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>0</td>
</tr>
<tr>
<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week &gt;2 days/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None Minor limitation Some limitation Extremely limited</td>
</tr>
<tr>
<td>Risk</td>
<td>Exacerbations requiring oral systemic corticosteroids</td>
</tr>
<tr>
<td>0.1/year</td>
<td>≥2 exacerbations in 6 months requiring oral systemic corticosteroids or ≥4 wheezing episodes/1 year lasting &gt;1 day ARD risk factors for persistent asthma</td>
</tr>
<tr>
<td>Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time. Exacerbations of any severity may occur in patients in any severity category.</td>
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</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.
### Classification of Asthma Severity (5–11 years of age)

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Intermittent</th>
<th>Persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>&lt;2 days/week</td>
<td>&gt;2 days/week but not daily</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>&lt;2x/month</td>
<td>3–4x/month</td>
</tr>
<tr>
<td>Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td>&lt;2 days/week</td>
<td>&gt;2 days/week but not daily</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor limitation</td>
</tr>
<tr>
<td>Lung function</td>
<td>Normal FEV₁, between exacerbations</td>
<td>FEV₁ &gt;80% predicted</td>
</tr>
<tr>
<td>Risk</td>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year (see note)</td>
</tr>
<tr>
<td>Recommended Step for Initiating Therapy</td>
<td>Step 1</td>
<td>Step 2</td>
</tr>
<tr>
<td>(See figure 4.1b for treatment steps.)</td>
<td>and consider short course of oral systemic corticosteroids</td>
<td>and consider short course of oral systemic corticosteroids</td>
</tr>
</tbody>
</table>

### Classification of Asthma Severity (≥12 years of age)

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Intermittent</th>
<th>Persistent</th>
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<tbody>
<tr>
<td>Symptoms</td>
<td>&lt;2 days/week</td>
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<tr>
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<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year (see note)</td>
</tr>
<tr>
<td>Recommended Step for Initiating Treatment</td>
<td>Step 1</td>
<td>Step 2</td>
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<tr>
<td>(See figure 4.5 for treatment steps.)</td>
<td>and consider short course of oral systemic corticosteroids</td>
<td>and consider short course of oral systemic corticosteroids</td>
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</table>

In 2–6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.
Classifying Severity AFTER Control is Achieved – All Ages

<table>
<thead>
<tr>
<th>Classification of Asthma Severity</th>
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<tbody>
<tr>
<td>Intermittent</td>
</tr>
<tr>
<td>Persistent</td>
</tr>
<tr>
<td>Step 1</td>
</tr>
<tr>
<td>Mild</td>
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<tr>
<td>Step 2</td>
</tr>
<tr>
<td>Step 3 or 4</td>
</tr>
<tr>
<td>Step 5 or 6</td>
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<tr>
<td>(already on controller)</td>
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</table>

Indicators of Poor Asthma Control:
The 4 important areas / questions (Keep it simple)

1- Daytime symptoms
   – SOB, chest tightness, cough, wheezing
2- Nighttime symptoms
   – wakens at night with SOB, chest tightness, cough, wheezing
3- Use of short-acting inhaled beta 2-agonists (SABAs)
   – > 2 days per week, daily
   – increased over baseline
4- Limitations of daily activities
   – Tricky: be specific

• Other obvious issues:
  – Urgent care visit
  – ER visit
  – Hospitalization
Asthma Control Test (EMR)

If your score is 19 or less, your asthma may not be controlled as well as it could be. Talk to your doctor.

**FOR PHYSICIANS:**

The ACT is:
- A simple, 5-question tool that is self-administered by the patient
- Recognized by the National Institutes of Health
- Clinically validated by specialist assessment and spirometry

Managing Asthma: Peak Flow Chart

**Peak Flow Chart**

- **How to use a peak flow chart at home.**
  1. Find your peak flow number in the morning and evening.
  2. Try morning and each evening blow three times.
  3. After each blow, read the spot where the marker stopped.
  4. Put the meter next to the peak flow chart to help you find the spot to mark.
  5. Circle the highest of the 3 numbers.

**People with moderate or severe asthma should take readings:**
- Every morning
- Every evening
- After an exacerbation
Spirometry

- Reduced FEV1/FVC ratio
- Reduced FEV1
- Normal FVC = pure obstruction
- Significant Bronchodilator response
- Reversible airway obstruction: asthma

### Clinically Useful FENO cut-points

<table>
<thead>
<tr>
<th>F_{NO}</th>
<th>Symptoms present during past 2-4 weeks</th>
<th>Symptoms absent</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>&lt;25 ppb</td>
<td>eosinophilic airway inflammation unlikely</td>
<td>adequate ICS dose</td>
<td>persistent allergic exposure</td>
</tr>
<tr>
<td>&lt;20 ppb</td>
<td>allergic to benefit from ICS</td>
<td>good compliance</td>
<td>inadequate ICS dose</td>
</tr>
<tr>
<td>25-50 ppb</td>
<td>consider alternative diagnoses</td>
<td>adequate ICS dose</td>
<td>risk for exacerbation</td>
</tr>
<tr>
<td>20-35 ppb</td>
<td>unlikely to benefit from ICS</td>
<td>good compliance</td>
<td></td>
</tr>
</tbody>
</table>
Asthma Control (Goals of Therapy)

Reducing Impairment
- Prevent chronic & troublesome symptoms.
- Prevent frequent use (< 2 days /wk) of inhaled SABA for symptoms.
- Maintain (near) “normal” pulmonary function.
- Maintain normal activity levels (including exercise & other physical activity & attendance at work or school).
- Meet patients’ and families’ expectations of and satisfaction with asthma care.

Reducing Risk
- Prevent recurrent exacerbations of asthma and minimize the need for ER visits and hospitalizations.
- Prevent progressive loss of lung function - for children, prevent reduced lung growth.
- Provide optimal pharmacotherapy with minimal or no adverse effects.
- Periodic assessments at 1-6 month intervals.
- Patient self-assessment.

2: Education

• Significance of diagnosis
• Inflammation as the underlying cause
• Controllers vs. quick-relievers
• How to use medication delivery devices
• Triggers, including 2nd hand smoke
• Home monitoring/ self-management
• How/when to contact the provider
• Need for continuous, on-going interaction with the clinician to step up/down therapy
• Annual influenza vaccine
• Provide all patients with a written asthma action plan that includes 2 aspects:
  – Daily management
  – How to recognize & handle worsening asthma symptoms
Managing Asthma: Asthma Action Plan

- Develop with a healthcare provider
- Tailor to meet individual needs
- Educate patients and families about all aspects of plan:
  - Recognizing symptoms
  - Medication benefits and side effects
  - Proper use of inhalers and Peak Expiratory Flow (PEF) meters

3: Environmental Factors

- Environment:
  - Reduce exposure to allergens they are sensitized to.
  - Avoid exertion outdoors when levels of air pollution are high.
  - Avoid use of nonselective beta-blockers
  - Use of humidifiers are not generally recommended.
  - Do not forget occupational exposures.

- Co-morbidities:
  - Allergic rhinitis
  - Sinusitis
  - GERD
  - OSA
  - Obesity
  - Infections
    - Influenza vaccination
    - ABPA
4: Medications

2 general classes:
- Long-term control medications
- Quick-Relief medications

• Controller medications:
  - Corticosteroids
  - Leukotriene modifiers (LTRA)
  - Long Acting Beta Agonists (LABA’s)
  - Cromolyn & Nedocromil
  - Methylxanthines: (theophylline)

• Quick-relief medications
  - Short acting bronchodilators (SABA’s)
  - Systemic corticosteroids
  - Anticholinergics

Inhaled Corticosteroids (ICS’s)

• ICS’s are the most effective long-term therapy available, are well tolerated & safe at recommended doses.

• The potential but small risk of adverse events from the use of ICS treatment is well balanced by their efficacy.

• The dose-response curve for ICS treatment begins to flatten at low to medium doses.

• Most benefit is achieved with relatively low doses, whereas the risk of adverse effects increases with dose.

• Use the lowest dose of ICS that maintains asthma control

• Advise patients to rinse their mouths (rinse and spit) after (ICS) inhalation.
### Estimated Comparative Daily Dosages of Inhaled Corticosteroids

<table>
<thead>
<tr>
<th>Drug</th>
<th>Low Dose</th>
<th>Medium Dose</th>
<th>High Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beclomethasone</td>
<td>168 - 504 mcg</td>
<td>504 - 840 mcg</td>
<td>&gt; 840 mcg</td>
</tr>
<tr>
<td>Budesonide DPI</td>
<td>200 - 400 mcg</td>
<td>400 - 600 mcg</td>
<td>&gt; 600 mcg</td>
</tr>
<tr>
<td>Flunisolide</td>
<td>500 - 1,000 mcg</td>
<td>1,000 - 2,000 mcg</td>
<td>&gt; 2,000 mcg</td>
</tr>
<tr>
<td>Fluticasone</td>
<td>88 - 264 mcg</td>
<td>264 - 660 mcg</td>
<td>&gt; 660 mcg</td>
</tr>
<tr>
<td>Triamcinolone</td>
<td>400 - 1,000 mcg</td>
<td>1,000 - 2,000 mcg</td>
<td>&gt; 2,000 mcg</td>
</tr>
</tbody>
</table>

Evaluate patient adherence and inhaler technique before increasing the dose of ICS.

### Medications to Treat Asthma: How to Use a Spray Inhaler

Remember to breathe in slowly.

1. Take off the cap. Shake the inhaler.

2. Stand up. Breathe out.

3. Put the inhaler in your mouth or put it just in front of your mouth. As you start to breathe in, push down on the top of the inhaler and keep breathing in slowly.

Medications to Treat Asthma: Spacers and nebulizers

- Spacers can help patients who have difficulty with inhaler use and can reduce potential for adverse effects from medication.

- Nebulizers are machines that produce a mist of the medication

- Used for small children or for severe asthma episodes

- No evidence that it is more effective than an inhaler used with a spacer

Long-Acting Beta$_2$-Agonists (LABA’s)

- Adding a LABA (salmeterol or formoterol) to patients whose asthma is not well controlled on low- or medium-dose ICS:
  - improves lung function
  - decreases symptoms
  - reduces exacerbations
  - reduces use of SABA for quick relief

- The FDA determined that a Black Box warning was warranted on all preparations containing a LABA.

- For patients who have asthma not sufficiently controlled with ICS alone, the option to increase the ICS dose should be given equal weight to the option of the addition of a LABA to ICS.

- It is not currently recommended that LABA be used for treatment of acute symptoms or exacerbations.

- LABAs are not to be used as monotherapy for long-term control
**Short-Acting Beta₂-Agonists (SABA’s)**

- SABAs are the most effective medications for relieving acute bronchospasm.
- Increasing use of SABA treatment or using SABA >2 days a week for symptom relief (not prevention of EIB) indicates inadequate control of asthma.
- Regularly scheduled, daily, chronic use of SABA is not recommended.

**NAEPP and GINA Guidelines**

Asthma severity: Classified the same

- Severe Persistent
- Moderate Persistent
- Mild Persistent
- Mild Intermittent

**Classified by:**

- Symptoms
- Activity levels
- Exacerbations
- FEV₁/PEFR
- PEFR variability

Severity is classified before therapy begins
Asthma Treatment: Principles of “Stepwise” Therapy

• The goal of asthma therapy is to:
  – maintain long-term control of asthma
  – with the least amount of medication
  – and minimal risk for adverse effects.

• Step up if not controlled.
  – If very poorly controlled, consider increase by 2 steps, oral corticosteroids, or both.
  – Before increasing pharmacologic therapy, consider as targets for therapy.
    – Adverse environmental exposures
    – Poor adherence
    – Co-morbidities
  – Visits every 2-6 weeks until control achieved.
  – When control achieved, contact every 3-6 months.

• Step-down in therapy:
  – With well-controlled asthma for at least 3 months.
  – Patients may relapse with total discontinuation or reduction of inhaled corticosteroids.

Stepwise Approach for Managing Asthma in Children 0-4 Years of Age

**Persistent Asthma: Daily Medication**
Consult asthma specialist if step 3 care or higher is required.
Consider consultation at step 2

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Preferred SABA PRN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Preferred Medium Dose ICS</td>
</tr>
<tr>
<td></td>
<td>Alternative Montelukast or Cromolyn</td>
</tr>
<tr>
<td>Step 3</td>
<td>Preferred High Dose ICS</td>
</tr>
<tr>
<td></td>
<td>AND Either: Montelukast or LABA</td>
</tr>
<tr>
<td>Step 4</td>
<td>Preferred Medium Dose ICS</td>
</tr>
<tr>
<td></td>
<td>AND Either: Montelukast or LABA</td>
</tr>
<tr>
<td>Step 5</td>
<td>Preferred High Dose ICS</td>
</tr>
<tr>
<td></td>
<td>AND Either: Montelukast or LABA</td>
</tr>
<tr>
<td>Step 6</td>
<td>Preferred High Dose ICS</td>
</tr>
<tr>
<td></td>
<td>AND Either: Montelukast or LABA</td>
</tr>
<tr>
<td></td>
<td>AND Oral corticosteroid</td>
</tr>
</tbody>
</table>

Step up if needed (first check adherence, environmental control)
Assess control
Step down if possible (and asthma is well controlled at least 3 months)

Patient Education and Environmental Control at Each Step
Stepwise approach for managing asthma in children 5-11 years of age

**Persistent Asthma: Daily Medication**
Consult asthma specialist if step 4 care or higher is required. Consider consultation at step 3

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

**Step 2**
- **Preferred**
  - Low dose ICS + LABA, or Theophylline
  - Medium Dose ICS

**Step 3**
- **Preferred**
  - Low dose ICS + LABA, or Theophylline
  - Medium Dose ICS

**Step 4**
- **Preferred**
  - Medium Dose ICS + LABA

**Step 5**
- **Preferred**
  - High Dose ICS + LABA
  - Medium Dose ICS + either LTRA, or Theophylline

**Step 6**
- **Preferred**
  - High Dose ICS + LABA

**Stepwise Approach for Managing Asthma: ≥12 Years of Age**

**Persistent Asthma: Daily Medication**
Consult asthma specialist if step 4 care or higher is required. Consider consultation at step 3

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

**Step 2**
- **Preferred**
  - Low-dose ICS + LABA OR – Medium dose ICS
  - Low-dose ICS + either LTRA, Theophylline, or Zileuton

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

**Step 4**
- **Preferred**
  - High Dose ICS + LABA
  - Consider Omalizumab for patients who have allergies

**Step 5**
- **Preferred**
  - High dose ICS + LABA + oral corticosteroid

**Step 6**
- **Preferred**
  - High dose ICS + LABA + oral corticosteroid

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

Each Step: Patient Education and Environmental Control and management of comorbidities
Steps 2 – 4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma
Step up therapy

• Asses severity first: remember the 4 key indicators of (poor) asthma control (Consider ACT)
  1-Daytime symptoms
  2-Nighttime symptoms
  3-Use of SABAs
  4-Limitation to activity

• Step up therapy:
  – Low dose ICS
  – Moderate dose ICS
  – Add LABA (never alone)
  – High dose ICS + LABA
  – Add leukotriene Antagonist

• What about: nedocromil /cromolyn, theophylline, anti IgE

Managing Exacerbations

• Early treatment of asthma exacerbations is the best strategy for management.
• Patient education includes a written asthma action plan to guide patient self-management of exacerbations.
• especially for patients who have moderate or severe persistent asthma and any patient who has a history of severe exacerbations.
• A peak-flow-based plan for patients who have difficulty perceiving airflow obstruction and worsening asthma.
• Appropriate intensification of therapy, often including a short course of oral corticosteroids.
• Removal of the environmental factors contributing to the exacerbation.
• Prompt communication between patient and clinician about any serious deterioration in symptoms or peak flow, decreased responsiveness to SABAs, or decreased duration of effect.
Asthma during Pregnancy

• During pregnancy, one third of patients have worse control of their asthma, one third have better control of their asthma, and one third have asthma that is unchanged.

• The potential threat of adverse effects from asthma medications is far outweighed by the danger of uncontrolled asthma to the fetus and mother.

• Poorly controlled asthma during pregnancy can cause increased perinatal mortality, increased prematurity, and low birth weight. Theophyllines, Beta2-agonists, inhaled or oral corticosteroids, or cromolyn can be used during pregnancy without significant risk of fetal abnormalities.

Asthma and Surgery

• Asthma patients are predisposed to respiratory complications following surgery, including:
  – respiratory arrest during induction of anesthesia
  – hypoxemia and possible hypercapnia
  – impaired effectiveness of cough
  – atelectasis
  – respiratory infection.

• The likelihood of these complications depends on:
  – the severity of the patient’s AHR
  – the degree of airflow obstruction
  – the amount of excess airway secretions at the time of surgery.

• Optimizing the patient’s lung function before surgery, including the administration of perioperative corticosteroids, is an important strategy for minimizing perioperative complications.
Newer Approaches in Asthma Management

• Anti-IgE: steps 5 and 6
• Bronchial thermoplasty: Step 7
Asthma management: key take home messages

• 4 major aspects of asthma management (not limited to medications):
  – Assessment and monitoring: H&P, PERF, spirometry, ACT
  – Education: action plan
  – Environmental control
  – Medication

• 4 key questions to determine asthma control and need to step up therapy:
  – Daytime symptoms
  – Nighttime symptoms
  – Use of SABAs
  – Limitation to activity

• 4 key medication groups:
  – **Corticosteroids**: Inhaled corticosteroids still the mainstay of therapy in children and adults
  – Leukotriene modifiers
  – LABA: Never prescribe LABA alone, always with ICS
  – SABA: limit use as much as possible
Indicators of Poor Asthma Control: step up therapy

- **Daytime symptoms**
  - SOB, chest tightness, cough, wheezing

- **Nighttime symptoms**
  - Wakens at night with SOB, chest tightness, cough, wheezing

- **Use of short-acting inhaled beta 2-agonists (SABAs)**
  - > 2 days per week, daily
  - Increased over baseline

- **Limitations of daily activities**
  - Tricky: be specific

- **Other obvious issues:**
  - Urgent care visit
  - ER visit
  - Hospitalization
Case: asthma diagnosis

- A 58 yo woman is evaluated for a 2 year history of episodic cough and chest tightness.
- Her symptoms began after a severe respiratory tract infection.
- Since then, she has had cough and chest discomfort after similar infections, typically lasting several weeks before resolving.
- She feels well between episodes.
- She is otherwise healthy and takes no medications.
- Physical exam reveals no abnormalities
- Spirometry is shown:

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Pred. LLN</th>
<th>Pred. FEV1/FVC</th>
<th>Pred. FVC</th>
<th>Pred. FEV1</th>
<th>Pred. %</th>
<th>Pred. FEV1/FVC</th>
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Spirometry: asthma diagnosis

- Normal FEV1/FVC ratio
- Normal FVC
- Normal FEV1
- Normal Spirometry
**Case discussion: asthma diagnosis**

Which of the following is the most appropriate next step in the evaluation of this patient?

- Bronchoscopy
- CT scan of the sinuses
- Exercise echocardiography
- Methacholine challenge testing

Main indication for methacholine challenge testing:

High suspicion for asthma with normal spirometry

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**Case presentation: persistent wheezing**

- You are asked to see a patient with a history of wheezing.
- The patient notes that the wheezing has been continuous, has been present for several months
- No response to bronchodilator medications
- No response to inhaled or systemic corticosteroids.

Is this Asthma?
Case discussion: persistent wheezing

- **DDX:**
  - refractory asthma
  - a condition mimicking asthma: “all that wheezes is not asthma”

- Atypical features for asthma in this patient:
  - the continuous nature of the wheezing
  - complete refractoriness to medication

- Consider:
  - abnormalities of the upper airway. Specifically, tracheal stenosis or fixed upper airway obstruction (e.g., that caused by tracheal tumors)
  - vocal cord dysfunction.

- Refer for further assessment
  - flow-volume loop
  - fiberoptic examination of the upper airway, observing both the vocal cords and the trachea to the level of the mainstem bronchi

---

Case: Follow up visit

- 35-year-old Female
- Developed asthma at age 22
- Uses SABA more often during last 6 mos
- Awakens at night with wheezing 4 times per month
- Daily Medication: low dose ICS
- PFT:
  - FEV1 93% baseline, 97% post dilator

Is her asthma well-controlled?
**Case discussion: Follow up visit**

- Mild persistent asthma
- poorly controlled on current therapy (low dose ICS)
- Need to step up
- What are the options?
  - Increase ICS
  - Add LABA
  - Add leukotriene antagonist
  - Other measures (emphasize very visit)
    - Adverse environmental exposures
    - Poor adherence
    - Inhaler technique
    - Co-morbidities
Case: New patient visit

- 28-year-old male recently transferred your area
- Asthma since childhood
- Takes low dose ICS
- Uses SABA 1-3 times daily
- Visits ER twice yearly
- Office spirometry: Baseline FEV1 65%, Post-bronchodilator 84%.

What do you think of her asthma control?

Stepwise Approach for Managing Asthma: >12 Years of Age

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Preferred: SABA PRN</th>
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</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Preferred: Low-dose ICS</td>
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<td>Alternative: Cromolyn, LTRA, Nedocromil or Theophylline</td>
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<tr>
<td>Step 3</td>
<td>Preferred: Medium-dose ICS + LABA</td>
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<td>OR – Medium-dose ICS</td>
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<tr>
<td>Alternative: Medium-dose ICS + either LTRA, Theophylline, or Zileuton</td>
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<td>Step 4</td>
<td>Preferred: High-dose ICS + LABA</td>
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<td>AND Consider Omalizumab for patients who have allergies</td>
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<td>Step 5</td>
<td>Preferred: Medium-dose ICS + LABA</td>
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<td>AND Consider Omalizumab for patients who have allergies</td>
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<tr>
<td>Step 6</td>
<td>Preferred: High-dose ICS + LABA + oral corticosteroid</td>
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<tr>
<td>AND Consider Omalizumab for patients who have allergies</td>
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</table>

Persistent Asthma: Daily Medication
Consult asthma specialist if step 4 care or higher is required. Consider consultation at step 3

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

Each Step: Patient Education and Environmental Control and management of comorbidities
Steps 2 – 4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma
Case discussion: New patient visit

- Moderate-Persistent Asthma
- Poorly controlled
- Need to step up
- What are the options?
  - Increase ICS
  - Add LABA
  - Add leukotriene antagonist
  - Other measures (always for new patients)
    - Adverse environmental exposures
    - Poor adherence
    - Inhaler technique
    - Co-morbidities

Case presentation: Asthma in Pregnancy

- 32-year-old white female with asthma
- 1st trimester of pregnancy
- During previous pregnancy had no SOB with limited SABA use
- Now has mild SOB each day
- Told by primary MD that “nothing is safe” in pregnancy.
- Buying “Primatene Mist” over the counter
- What happens to asthma during pregnancy?
  - Stable
  - Better
  - Worse
Case discussion: Asthma in Pregnancy

- Persistent asthma in pregnancy
- She is not on any controller therapy
- Controller therapy required
- Which one?
  - ICS:
    - Budesonide safety data on file with FDA
    - Other ICS- fewer safety studies in pregnancy available
    - No evidence that any ICS agent is unsafe.
  - Best choices:
    - Low dose ICS and LABA (based on efficacy Studies)
    - Moderate dose ICS (budesonide is most studied)
- Keep in mind: Benefits of treatment always outweigh risk of exacerbation of asthma during pregnancy

Case presentation: asthma exacerbation

- A 41 yo woman with a 15 year history of asthma
- Has been well controlled on moderate-dose inhaled corticosteroids plus as-needed inhaled albuterol.
- Calls you with worsening asthma symptoms
  - frequent nighttime episodes of wheezing
  - using her albuterol inhaler 6 to 8 times a day
  - no significant sputum production
- Recent acute respiratory tract infection
- On physical exam
  - Diffuse wheezing
  - Her peak flow is 40% below her baseline value.
Case Discussion: Asthma exacerbation

- Which of the following is the most appropriate management for this patient?
  a. 7-day course of a fluoroquinolone
  b. Leukotriene modifying agent
  c. Long-acting β-agonist
  d. Nebulized albuterol at home
  e. Short course of oral corticosteroid

Quickest way to get patient back to baseline after an exacerbation

Case presentation: Emergency room

- 46 year-old Hispanic female with a 2 week history of SOB presents to ER with an asthma exacerbation (attack).

- How do you treat?
  - Albuterol: 2.5 mg q20 minutes for 1 hour; then q 1 hr
  - Solu Medrol: 125 mg IVP x 1, then 60-80 mg IVP q 6-8
  - Ipratropium: Add to albuterol if initial response poor, Or alternate q 1hr
  - Leukotriene antagonists?
Case discussion: Emergency Department

• Measure FEV1 or PEF:
  – Upon presentation (begin treatment as soon as asthma exacerbation is recognized)
  – After first beta2-agonist dose
  – After third beta2-agonist dose
  – At intervals depending on response to therapy
  – Before discharge

• Monitor SaO2 in patients with
  – severe distress
  – FEV1 or PEF <50% predicted

Asthma management: key take home messages

• 4 major aspects of asthma management (not limited to medications):
  – Assessment and monitoring: H&P, PERF, spiro, ACT
  – Education: action plan
  – Environmental control
  – Medication

• 4 key questions to determine asthma control and need to step up therapy:
  – Daytime symptoms
  – Nighttime symptoms
  – Use of SABAs
  – Limitation to activity

• 4 key medication groups:
  – **Corticosteroids**: Inhaled corticosteroids still the mainstay of therapy in children and adults
  – Leukotriene modifiers
  – LABA: Never prescribe LABA alone, always with ICS
  – SABA: limit use as much as possible
Always, always, always: check inhaler technique

Asthma Resources

- National Asthma Education and Prevention Program (NAEPP)
  - www.nhlbi.nih.gov/about/naepp
- CDC School Asthma Website and Materials
  - www.cdc.gov/asthma
- PACE: Physician Asthma Care Education
- American College of Allergy, Asthma, and Immunology
  - http://www.acaai.org
- American College of Chest Physicians
  - http://www.chestnet.org
- American Thoracic Society
  - http://www.thoracic.org