A Tale of Two Patients:  
The Diagnosis and Management of Adult Asthma  
A Case-based CME Activity  
Jointly Sponsored by Global Education Group & Educational Awareness Solutions  
Supported by a Grant from Boehringer Ingelheim Pharmaceuticals, Inc.
• Upon completion of this activity, participants should be able to:
  – Describe the process for diagnosing asthma and how a differential diagnosis may be formulated between asthma and COPD
  – Recognize evidence-based methods for assessing and monitoring asthma in various patient types
  – Identify the safety, tolerability and effectiveness of existing pharmacologic agents for the management of asthma
  – Identify barriers to patient adherence and methods to address non-adherence
A Note on the Educational Method

• This activity provides information regarding the differential diagnosis of asthma
• It then illustrates two very similar patient cases with two very different clinical approaches and their resulting outcomes
• The repeated patient information on subsequent slides is provided intentionally, to demonstrate the similarities between these two typical patients
• Subsequent disparities revealed in clinical approaches and outcomes will become quite apparent
• We hope you find value in this educational method
Epidemiology

- 18.7 million (8.0%) of American adults currently have asthma
- 14.2 million visits to physician offices result in asthma as primary diagnosis
- 1.3 million visits to hospital outpatient departments report asthma as primary diagnosis
- 1.8 million visits to emergency departments are the result of asthma as primary diagnosis
- 439,000 hospitalizations with discharges cite asthma as first-listed diagnosis (3.6 days is the average length of stay)
- 3,404 deaths are caused by asthma annually (1.1 per 100,000 population)

2. National Ambulatory Medical Care Survey: 2010 Summary Tables, table 13
3. National Hospital Ambulatory Medical Care Survey: 2010 Outpatient Department Summary Tables, table 11
4. National Hospital Ambulatory Medical Care Survey: 2010 Emergency Department Summary Tables, table 12
5. National Hospital Discharge Survey: 2010 table, Average length of stay and days of care – Number and rate of discharges by first-listed diagnostic categories
6. Deaths: Final Data for 2010, tables 10, 11
An asthma diagnosis should be established by determining that:

- Symptoms of recurrent episodes of airflow obstruction or airway hyperresponsiveness are present
  - Key symptoms that increase the probability of asthma include:
    - Wheezing, cough, shortness of breath, chest tightness
  - Symptoms typically occur or worsen at night, or in the presence of:
    - Exercise, viral infection, allergens, irritants, changes in weather, strong emotional expression, stress, menstrual cycles
- Airflow obstruction is at least partially reversible
  - Reversibility should determined by an increase in FEV$_1$ of $>200$ mL and $\geq 12\%$ from baseline measured after inhalation of a short-acting beta2-agonist
- Alternative diagnoses are excluded

Recommended methods to establish the asthma diagnosis are:

- Detailed medical history
- Physical examination
- Spirometry
  - Spirometry is an essential objective method to establish the diagnosis of asthma, because history and physical examination are not reliable methods of assessing lung function or excluding other diagnoses
In some middle-aged to older patients, it is sometimes difficult to differentiate asthma from other respiratory disorders such as COPD.

Studies that may be useful when considering other diagnoses:

- **Spirometry**
  - An increase of ≥ 10% of the predicted FEV₁ after inhalation of a short-acting beta₂-agonist may have higher likelihood of differentiating patients who have asthma from those who have COPD.

- **Bronchoprovocation with methacholine, histamine, cold air, or exercise challenge**
  - Positive test is indicative of airway hyperresponsiveness and asthma.
  - Negative test may help rule out asthma.

- **Chest X-ray**

- **Biomarkers of inflammation**
  - Being evaluated for usefulness in asthma diagnosis.
  - Biomarkers include total and differential cell count and mediator assays in sputum, blood, urine, and exhaled air.
### Differential Diagnosis of COPD – American Thoracic Society

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Suggestive features</th>
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<tbody>
<tr>
<td><strong>COPD</strong></td>
<td>Mid-life onset</td>
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<td></td>
<td>Slowly progressing symptoms</td>
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<td></td>
<td>Long history of smoking</td>
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<tr>
<td><strong>Asthma</strong></td>
<td>Early onset</td>
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<td></td>
<td>Varying symptoms</td>
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<td></td>
<td>Symptoms during the night/early morning</td>
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<td></td>
<td>Presence of allergy, rhinitis and/or eczema</td>
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<td></td>
<td>Family history</td>
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<tr>
<td></td>
<td>Airflow limitation that is largely reversible</td>
</tr>
<tr>
<td><strong>Congestive heart failure</strong></td>
<td>Fine basilar crackles on auscultation</td>
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<tr>
<td></td>
<td>Dilated heart on chest radiography</td>
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<tr>
<td></td>
<td>Pulmonary edema</td>
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<tr>
<td></td>
<td>Volume restriction not airflow limitation on pulmonary function tests</td>
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<tr>
<td><strong>Bronchiectasis</strong></td>
<td>Large volume of purulent sputum</td>
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<tr>
<td></td>
<td>Commonly associated with bacterial infection</td>
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<tr>
<td></td>
<td>Coarse crackles on auscultation</td>
</tr>
<tr>
<td></td>
<td>Bronchial dilation and bronchial wall thickening on chest radiography/CT</td>
</tr>
<tr>
<td><strong>Tuberculosis</strong></td>
<td>Onset at all ages</td>
</tr>
<tr>
<td></td>
<td>Lung infiltrate on chest radiography</td>
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<tr>
<td></td>
<td>Microbiological confirmation</td>
</tr>
<tr>
<td></td>
<td>High local prevalence of tuberculosis</td>
</tr>
<tr>
<td><strong>Obliterative bronchiolitis</strong></td>
<td>Younger onset and in non-smokers</td>
</tr>
<tr>
<td></td>
<td>History of rheumatoid arthritis/fume exposure</td>
</tr>
<tr>
<td></td>
<td>Hypodense areas on expiration on CT</td>
</tr>
<tr>
<td><strong>Diffuse panbronchiolitis</strong></td>
<td>Affects mostly male non-smokers</td>
</tr>
<tr>
<td></td>
<td>Almost all have chronic sinusitis</td>
</tr>
<tr>
<td></td>
<td>Diffuse small centrilobular nodular opacities and hyperinflation on chest radiography and HRCT</td>
</tr>
</tbody>
</table>

Some patients with chronic asthma cannot be distinguished from COPD with the current imaging or lung function testing. In these cases, it is assumed that the two diseases (asthma and COPD) co-exist and their management should be similar to that of asthma.

CT: computed tomography; HRCT: high-resolution computed tomography.

• In 2007, the National Asthma Education and Prevention Program (NAEPP), coordinated by the National Heart, Lung, and Blood Institute (NHLBI), released its most recent report:
  • The guidelines provide recommendations for the individualized treatment of asthma and provide guidance for maintaining treatment based on the level of asthma control
The National Asthma Control Initiative (NACI) is focusing on 6 priority Guidelines Implementation Panel (GIP) messages that reinforce the asthma guidelines’ clinical practice recommendations vital for asthma control and high-quality patient-centered care:

– Assess asthma severity at the first visit to determine initial treatment
– Use inhaled corticosteroids to control asthma
– Control environmental exposures that worsen the patient’s asthma
– Use written asthma action plans to guide patient self-management
– Schedule follow-up visits at periodic intervals
– Assess and monitor asthma control and adjust treatment if needed
When assessment and management guidelines are taken into consideration, many asthma patients demonstrate positive clinical outcomes:

- Improved control of asthma and overall health status
- Better quality of life
- Reduced limitation on activities
- Fewer urgent care visits and hospitalizations

The cases that follow reflect two typical young adult patients and are provided to illustrate the ways that clinical approaches can impact asthma outcomes.
Meet the Patients

Patient Case 1: Laura B.
22-year-old, female college student with a history of asthma

Patient Case 2: Olívia W.
20-year-old, female college student with a history of asthma
**History**

### Patient Case 1: Laura B.

- Dyspnea, cough, wheezing, and chest tightness that occasionally limits her ability to remain on the basketball court
- Symptoms becoming more frequent in the past year
  - Symptoms > 2 days/week, but not daily
  - Nighttime awakenings (3-4 per month)
  - Minor limitation in activity
- Perennial allergies (dust mites)
- Current medications:
  - Short-acting beta2-agonist as needed
  - Non-sedating antihistamine
  - Intranasal corticosteroid
- In the past year, 2 asthma exacerbations have required oral systemic corticosteroid treatment

### Patient Case 2: Olivia W.

- Dyspnea, cough, wheezing, and chest tightness that occasionally limits her ability to remain on the basketball court
- Symptoms becoming more frequent in the past year
  - Symptoms > 2 days/week, but not daily
  - Nighttime awakenings (3-4 per month)
  - Minor limitation in activity
- Perennial allergies (dust mites)
- Current medications:
  - Short-acting beta2-agonist as needed
  - Non-sedating antihistamine
  - Intranasal corticosteroid
- In the past year, 2 asthma exacerbations have required oral systemic corticosteroid treatment
Physical Exam and Test Results

Patient Case 1: Laura B.

- Normal lung and heart exam
- ✗ Pulmonary function tests (spirometry): Not Performed

Patient Case 2: Olivia W.

- Normal lung and heart exam
- ✗ Pulmonary function tests (spirometry):
  - Prebronchodilator (short-acting)
    - \( FEV_1 \): 3.42 L
      - 87% of predicted\(^1\)
    - \( FEV_1/FVC \): 86% (normal\(^2\))
  - Post bronchodilator
    - \( FEV_1 \): 3.88 L
      - 13.5% (460 mL) improvement vs. prebronchodilator \( FEV_1 \)

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Patient Case 1: Laura B.

✗ Laura B’s asthma severity: Not Assessed
  – Neither current impairment nor future risk

Patient Case 2: Olivia W.

✓ Olivia W’s asthma severity: *Mild persistent* (per the asthma guidelines\(^1\)) based on:
  – Current impairment\(^1\)
    • Symptoms > 2 days/week but not daily
    • Nighttime awakenings 3 to 4/month
    • Minor limitation in normal activity
    • Spirometry results
      – FEV\(_1\) > 80% predicted; FEV\(_1\)/FVC normal
      – Reversibility in FEV\(_1\) demonstrated after the administration of a short-acting bronchodilator (>12% improvement in FEV\(_1\) and a 200 mL increase)
  – Future risk\(^1\)
    • Risk of ≥ 2 exacerbations per year requiring oral systemic corticosteroids (based on recent history)

## Classification of Asthma Severity

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity (Youths ≥12 years of age and adults)</th>
<th>Persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
<td>Mild</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
<td>&gt;2 days/week but not daily</td>
</tr>
<tr>
<td>Nighttime awakening</td>
<td>≤2x/month</td>
<td>3-4x/month</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>none</td>
<td>Minor limitation</td>
</tr>
<tr>
<td>Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
<td>&gt;2 days/week but not &gt;1x/day</td>
</tr>
<tr>
<td>Lung Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal FEV₁ between exacerbations</td>
<td>FEV₁ ≥80% predicted</td>
</tr>
<tr>
<td></td>
<td>FEV₁/FVC normal</td>
<td>FEV₁/FVC normal</td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0-1/year (see note)</td>
<td>≥2/year (see note)</td>
</tr>
</tbody>
</table>

Notes:
- Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2-4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

- Relative annual risk of exacerbations may be related to FEV₁

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Patient Case 1: Laura B.

✓ After some discussion regarding treatment options, Laura B. expresses hesitancy about the chronic use of inhaled corticosteroids, citing concerns about thrush and increases in blood sugar (Laura B’s parents both have type 2 diabetes mellitus).

Patient Case 2: Olivia W.

✓ After some discussion regarding treatment options, Olivia W. expresses reluctance toward the chronic use of inhaled corticosteroids, citing concerns about eye problems and bone thinning (Olivia’s grandmother has osteoporosis).
Medications for asthma are categorized into two general classes: long-term control medications used to achieve and maintain control of persistent asthma and quick-relief medications used to treat acute symptoms and exacerbations.

**Available Treatments**

Medications for asthma are categorized into two general classes: long-term control medications used to achieve and maintain control of persistent asthma and quick-relief medications used to treat acute symptoms and exacerbations.

**Long-term control medications (listed in alphabetical order)**

- **Corticosteroids**: Block late-phase reaction to allergen, reduce airway hyperresponsiveness, and inhibit inflammatory cell migration and activation. They are the most potent and effective anti-inflammatory medication currently available (Evidence A). ICSs are used in the long-term control of asthma. Short courses of oral systemic corticosteroids are often used to gain prompt control of the disease when initiating long-term therapy; long-term oral systemic corticosteroid is used for severe persistent asthma.

- **Cromolyn sodium and nedocromil**: Stabilize mast cells and interfere with chloride channel function. They are used as alternative, but not preferred, medication for the treatment of mild persistent asthma (Evidence A). They can also be used as preventive treatment prior to exercise or unavoidable exposure to known allergens.

The system used to describe the level of evidence is as follows:

- **Evidence Category A: Randomized controlled trials (RCTs), rich body of data**. Evidence is from end points of well-designed RCTs that provide a consistent pattern of findings in the population for which the recommendation is made. Category A requires substantial numbers of studies involving substantial numbers of participants.

- **Evidence Category B: RCTs, limited body of data**. Evidence is from end points of intervention studies that include only a limited number of patients, post hoc or subgroup analysis of RCTs, or meta-analysis of RCTs. In general, category B pertains when few randomized trials exist; they are small in size, they were undertaken in a population that differs from the target population of the recommendation, or the results are somewhat inconsistent.

- **Evidence Category C: Nonrandomized trials and observational studies**. Evidence is from outcomes of uncontrolled or nonrandomized trials or from observational studies.

- **Evidence Category D: Panel consensus judgment**. This category is used only in cases where the provision of some guidance was deemed valuable, but the clinical literature addressing the subject was insufficient to justify placement in one of the other categories. The Panel consensus is based on clinical experience or knowledge that does not meet the criteria for categories A through C.

Available Treatments

Long-term control medications – continued

• **Immunomodulators**: Omalizumab (anti-IgE) is a monoclonal antibody that prevents binding of IgE to the high-affinity receptors on basophils and mast cells. Omalizumab is used as adjunctive therapy for patients ≥12 years of age who have allergies and severe persistent asthma (Evidence B). Clinicians who administer omalizumab should be prepared and equipped to identify and treat anaphylaxis that may occur.

• **Leukotriene modifiers**: Include LTRAs and a 5-lipoxygenase inhibitor. Two LTRAs are available- montelukast (for patients >1 year of age) and zafirlukast (for patients ≥7 years of age). The 5-lipoxygenase pathway inhibitor zileuton is available for patients ≥12 years of age; liver function monitoring is essential. LTRAs are alternative, but not preferred, therapy for the treatment of mild persistent asthma (Step 2 care) (Evidence A). LTRAs can also be used as adjunctive therapy with ICSs, but for youths ≥12 years of age and adults they are not the preferred adjunctive therapy compared to the addition of LABAs (Evidence A). Zileuton can be used as alternative but not preferred adjunctive therapy in adults (Evidence D).

• **LABAs**: Salmeterol and formoterol are bronchodilators that have a duration of bronchodilation of at least 12 hours after a single dose.
  - LABAs are not to be used as monotherapy for long-term control of asthma (Evidence A).
  - LABAs are used in combination with ICSs for long-term control and prevention of symptoms in moderate or severe persistent asthma (step 3 care or higher in children ≥5 years of age and adults) (Evidence A for ≥12 years of age, Evidence B for 5–11 years of age).
Long-term control medications – continued

• **LABAs**: (Continued)
  - Of the adjunctive therapies available, LABA is the preferred therapy to combine with ICS in youths ≥12 years of age and adults (Evidence A).
  - In the opinion of the Expert Panel, the beneficial effects of LABA in combination therapy for the great majority of patients who require more therapy than low-dose ICS alone to control asthma (i.e., require step 3 care or higher) should be weighed against the increased risk of severe exacerbations, although uncommon, associated with the daily use of LABAs.
    - For patients ≥5 years of age who have moderate persistent asthma or asthma inadequately controlled on low-dose ICS, the option to increase the ICS dose should be given equal weight to the option of adding LABA.
    - For patients ≥5 years of age who have severe persistent asthma or asthma inadequately controlled on step 3 care, the combination of LABA and ICS is the preferred therapy.
  - LABA may be used before exercise to prevent EIB (Evidence A), but duration of action does not exceed 5 hours with chronic regular use. Frequent and chronic use of LABA for EIB is discouraged, because this use may disguise poorly controlled persistent asthma (Evidence D).
  - In the opinion of the Expert Panel, the use of LABA for the treatment of acute symptoms or exacerbations is not currently recommended (Evidence D).

Long-term control medications – continued

• **Methylxanthines**: Sustained-release theophylline is a mild to moderate bronchodilator used as alternative, not preferred, adjunctive therapy with ICS (Evidence A). Theophylline may have mild anti-inflammatory effects. Monitoring of serum theophylline concentration is essential.

Quick-relief medications (listed in alphabetical order)

• **Anticholinergics**: Inhibit muscarinic cholinergic receptors and reduce intrinsic vagal tone of the airway. Ipratropium bromide provides additive benefit to SABA in moderate-to-severe asthma exacerbations. May be used as an alternative bronchodilator for patients who do not tolerate SABA (Evidence D).

• **SABAs**: Albuterol, levalbuterol, and pirbuterol are bronchodilators that relax smooth muscle. Therapy of choice for relief of acute symptoms and prevention of EIB (Evidence A).

• **Systemic corticosteroids**: Although not short acting, oral systemic corticosteroids are used for moderate and severe exacerbations as adjunct to SABAs to speed recovery and prevent recurrence of exacerbations (Evidence A).

New Treatments on the Horizon

• There are numerous agents currently being investigated for the treatment of asthma
  
  – Ultra long-acting inhaled beta\(_2\)-agonists (olodaterol, vilanterol, indacaterol\(^1,2\))
    • Provide 24-hour bronchodilation that may allow for once-daily dosing\(^1,2\)
    • Being researched in combination with inhaled corticosteroids\(^1,2\)
  
  – Long-acting inhaled anticholinergic bronchodilator (tiotropium)\(^3\)
    • Approved for use in COPD\(^3\)
    • Provides modest sustained bronchodilation, improves pulmonary function, decreases asthma exacerbations, and reduces corticosteroid requirements in patients with poorly controlled asthma\(^3,4\)
  
  – Monoclonal antibodies (reslizumab [IL-5], lebrikizumab [IL-13], and tralokinumab [IL-13])\(^5,6,7\)
    • Parentally administered agents\(^5,6,7\)
    • Provide improved lung function in patients with poorly controlled asthma despite high-dose inhaled corticosteroid therapy\(^5,6,7\)
    • Well tolerated\(^5,6,7\)

Patient Case 1: **Laura B.**

- Clinician prescribes another course of oral corticosteroids and advises Laura B. to continue using the short-acting beta2-agonist as needed.
- Clinician appears rushed based on the patient load in the clinic and does not counsel Laura B. on her medications.

Patient Case 2: **Olivia W.**

- Clinician explains the facts about low-dose inhaled corticosteroids vs. oral corticosteroids.
- Olivia W. agrees to try a low-dose inhaled corticosteroid (Step 2 therapy) to be used every day and continuation of short-acting beta2-agonist as needed for symptoms per the asthma guidelines\(^1\).
- Clinician also prescribes a spacer to be used with the inhalers to optimize inhaler safety and efficacy.
- Clinician has Olivia W. consult with an Allied Health Professional (AHP) within the clinic regarding appropriate inhaler/spacer technique.
  - AHP demonstrates technique.
  - Olivia W. demonstrates proper technique to the AHP (teach-back method).
  - AHP advises Olivia W. to rinse her mouth (rinse and spit) and brush her teeth after use of the inhaled corticosteroid.

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### Stepwise Approach for Managing Asthma

**YOUTHS ≥12 YEARS OF AGE AND ADULTS**

<table>
<thead>
<tr>
<th>Intermittent Asthma</th>
<th>Persistent Asthma: Daily Medication</th>
</tr>
</thead>
</table>
| **Step 1** | Preferred: Low-dose ICS  
Alternative: SABA PRN |
| **Step 2** | Preferred: Medium-dose ICS + LABA and  
Alternative: Low-dose ICS + LABA or  
Cromolyn, LTRA, Nedocromil, or Theophylline |
| **Step 3** | Preferred: High-dose ICS + LABA  
And Consider Omalizumab for patients who have allergies |
| **Step 4** | Preferred: High-dose ICS + LABA and  
Alternative: Medium-dose ICS + either LTRA, Theophylline, or Zileuton |
| **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) |

Each step: Patient education, environment control, and management of comorbidities. Steps 2-4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma (see notes on next slide).

**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.

**Key:** Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy. EIB, exercise-induced bronchospasm; ICS, inhaled corticosteroid; LABA, long-acting inhaled beta₂-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short acting Beta₂-agonist

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Notes:
• The stepwise approach is meant to assist, not replace the clinical decision making required to meet individual patient needs.
• If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
• Zileuton is a less desirable alternative due to limited studies as adjunctive therapy and the need to monitor liver function. Theophylline requires monitoring of serum concentration levels.
• In step 6, before oral systemic corticosteroids are introduced, a trial of high-dose ICS + LABA + either LTRA, theophylline, or Zileuton may be considered, although this approach has not been studied in clinical trials.
• Step 1, 2, and 3 preferred therapies are based on Evidence A; step 3 alternative therapy is based on Evidence A for LTRA, Evidence B for theophylline, and Evidence D for zileuton. Step 4 preferred therapy is based on Evidence B, and alternative therapy is based on Evidence B for LTRA and theophylline and Evidence D for zileuton. Step 5 preferred therapy is based on Evidence B. Step 6 preferred therapy is based on (EPR—2 1997) and Evidence B for omalizumab.
• Immunotherapy for steps 2-4 is based on Evidence B for house-dust mites, animal dander and pollens; evidence is weak or lacking for molds and cockroaches. Evidence is strongest for immunotherapy with single allergens. The role of allergy in asthma is greater in children than in adults.
• Clinicians who administer immunotherapy or omalizumab should be prepared and equipped to identify and treat anaphylaxis that may occur.
**Patient Case 1: Laura B.**

✗ Clinician does not take a history of Laura B’s asthma triggers.

**Patient Case 2: Olivia W.**

✓ Upon taking an asthma trigger history, the clinician suspects dust mites are triggering Olivia W’s asthma symptoms.

✓ Clinician asks the AHP within the clinic to teach Olivia, in simple language, how to control dust mites, including the following actions¹:

  – Encase mattress and pillows in dust mite proof covers
  – Wash bedding each week in hot water (> 130 °F to kill the mites)
  – Reduce indoor humidity to ≤ 50%, ideally 30-50%, to minimize dust mite levels
    • Reduce humidity by using an air conditioner or dehumidifier
    • Avoid use of humidifiers
  – Remove (or minimize) carpeting, rugs, and drapes
  – Avoid sleeping on upholstered furniture

Patient Case 1: Laura B.

- Clinician sends an electronic prescription for the oral corticosteroid to Laura B’s pharmacy
- Does not provide Laura B. with a written asthma action plan

Patient Case 2: Olivia W.

- The AHP develops a tailored, written asthma action plan for Olivia W. and reviews it with her.
- The asthma action plan includes elements recommended by the asthma guidelines\(^1\) including:
  - Information and instructions for Olivia W. regarding how she can self-manage her asthma daily:
    - When to use her inhalers and how much to use
    - Reminders about avoiding dust mite exposure
  - Special instructions to help Olivia W.:
    - Use symptom occurrence and peak flow meter readings to assess her asthma control
    - Understand when, how, and who to contact in an emergency

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A sample copy of an asthma plan can be found at:

Scheduling Follow-up Visit at an Appropriate Interval

Patient Case 1: Laura B.

Clinician advises Laura B. to call the office if symptoms persist or return.

Patient Case 2: Olivia W.

Clinician has Olivia W. schedule a follow-up appointment within 2-6 weeks, per the asthma guidelines¹

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**Patient Case 1: Laura B.**

- No follow-up visit

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**Patient Case 2: Olivia W.**

- Olivia W. reports that she has had just one mild occurrence of wheezing (peak flow 75% of personal best) while participating in an intense basketball game, which she controlled with the assistance of her asthma action plan and short-acting beta2-agonist.

- She states that she:
  - Is able to fully participate in basketball practices and games
  - Has taken steps to control dust mites by encasing her mattress and pillows in dust mite proof covers, washing her sheets and blankets each week in hot water, purchasing and using a dehumidifier, and removing the carpets from her apartment

- As requested by the clinician, Olivia W. has brought her inhaled corticosteroid canister to the appointment, and the clinician confirms Olivia W’s inhaler adherence by verifying that the appropriate amount of medication in the canister has been consumed

- Inhaler and spacer technique education is reinforced (via the teach-back method) per the asthma guidelines^1^

- The clinician uses this recent history to assess Olivia W’s asthma control (current impairment and future risk), maintains the current therapy (Step 2), and has Olivia schedule a follow-up appointment in 3-6 months, per the asthma guidelines^1^

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Patient Case 1: **Laura B.**

- Laura B. returns to the office following a visit to the emergency room for an acute exacerbation of asthma symptoms
- She reports that shortly after the oral corticosteroid regimen, her daytime and nighttime symptoms returned, and she has had increasing limitation of her activities, including a more difficult time keeping up when playing basketball
- The clinician refers Laura B. to an asthma specialist

Patient Case 2: **Olivia W.**
Patient Case 1: **Laura B.**

- No longer followed in this practice

Patient Case 2: **Olivia W.**

- At the subsequent 3-month follow-up visit, and an additional 3-month follow-up visit (6 months since the initial visit), Olivia W. reports continued asthma control and medication adherence
- Olivia W. completes the 5-question, validated Asthma Control Test\(^1,2\) and scores 25 out of 25, indicating that her asthma is controlled
- The clinician’s assessment of Olivia W’s asthma (impairment and risk) concludes that she has been well controlled for 6 months and the decision is made to scale down therapy to Step 1 by discontinuing the inhaled corticosteroid, per the asthma guidelines\(^3\)
- The clinician reviews Olivia’s asthma action plan and inhaler/spacer technique with her and has her schedule a follow-up appointment in 3 months, per the asthma guidelines\(^3\)

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Assessing Asthma Control and Adjusting Therapy

**Classification of Asthma Control**

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Components of Control</th>
<th>Well-Controlled</th>
<th>Not Well-Controlled</th>
<th>Very Poorly Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms</strong></td>
<td>≤2 days/week</td>
<td>&gt;2 days/week</td>
<td>Throughout the day</td>
<td></td>
</tr>
<tr>
<td><strong>Nighttime awakening</strong></td>
<td>≤2x/month</td>
<td>1-3x/week</td>
<td>≥4x/week</td>
<td></td>
</tr>
<tr>
<td><strong>Interference with normal activity</strong></td>
<td>None</td>
<td>Some limitation</td>
<td>Extremely limited</td>
<td></td>
</tr>
<tr>
<td><strong>Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</strong></td>
<td>≤2 days/week</td>
<td>&gt;2 days/week</td>
<td>Several times per day</td>
<td></td>
</tr>
<tr>
<td><strong>FEV₁, or peak flow</strong></td>
<td>&gt;80% predicted/ personal best</td>
<td>60-80% predicted/ personal best</td>
<td>&lt;60% predicted/ personal best</td>
<td></td>
</tr>
<tr>
<td><strong>Validated Questionnaires</strong></td>
<td><strong>ATAQ</strong></td>
<td><strong>ACQ</strong></td>
<td><strong>ACT</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1-2</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≤0.75*</td>
<td>≥1.5</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥20</td>
<td>16-19</td>
<td>≤15</td>
<td></td>
</tr>
</tbody>
</table>

**Exacerbations**

0-1/year | ≥2/year (see note) Consider severity and interval since last exacerbation

**Risk**

Progressive loss of lung function | Evaluation requires long-term followup care

Treatment-related adverse effects | 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.

Notes:
The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient’s recall of previous 2–4 weeks and by spirometry/or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient’s asthma is better or worse since the last visit.

At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.

*ACQ values of 0.76-1.4 are indeterminate regarding well-controlled asthma.

Key: EIB, exercise-induced bronchospasm; FEV₁, forced expiratory volume in 1 second.

Summary and Conclusions

• Proper assessment and management of asthma can benefit patients of all ages

• Spirometric testing is helpful in establishing an asthma diagnosis

• When assessing asthma severity and management strategies, the evidence-based asthma guidelines should be implemented to best optimize patient outcomes

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