Improving Outcomes in the Management & Treatment of Asthma

April 21, 2016
2016 Spring Managed Care Forum

David M. Mannino, M.D.
Professor
Department of Preventive Medicine and Environmental Health
University of Kentucky, College of Public Health

Disclosures

- Research Grants
  - GlaxoSmithKline
  - Pfizer
  - Novartis
  - Astra-Zeneca
- Advisory Boards
  - GlaxoSmithKline
  - Pfizer
  - Astra-Zeneca
  - Novartis
  - Merck
  - Nycomed
  - Forest
  - Amgen
- Expert Witness
  - In Environmental Tobacco Smoke exposure cases (Plaintiffs)
  - Diacetyl exposure cases (Defense)
  - Tobacco and Lung Disease cases (Plaintiffs)
- Chief Scientific Officer - COPD Foundation
Objectives

- Identify the safety and efficacy of emerging treatment strategies for poorly controlled asthma
- Discuss appropriate treatment strategies for patients with persistent asthma uncontrolled on inhaled corticosteroids
- Analyze the available and emerging biologic agents for treatment options in patients with severe asthma
- Review the potential implications of new guidelines and data on patient selection and treatment options to control symptoms, reduce exacerbations and improve the quality of life of severe asthma patients
- Assess different strategies to overcome barriers of care and educate patients on the importance of adherence to better understand and manage their asthma
# Assessment of Asthma Severity

## Severe Asthma Phenotypes

**Classification of Asthma Severity**

<table>
<thead>
<tr>
<th>Component of Severity</th>
<th>Intermittent</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>&lt; 2 days/week</td>
<td>&gt; 2 days/week but not daily</td>
<td>Daily</td>
<td>Throughout the day</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>&lt; 1/month</td>
<td>&gt; 1/month</td>
<td>&gt; 2 weeks</td>
<td>&gt;1 week</td>
</tr>
<tr>
<td>Short acting inhaled bronchodilator use (not included in ICS)</td>
<td>&lt; 2 days/week</td>
<td>&gt; 2 days/week but not daily</td>
<td>Daily</td>
<td>Several times per day</td>
</tr>
<tr>
<td>Asthma exacerbations requiring urgent medical attention and systemic corticosteroids</td>
<td>None</td>
<td>Minor limitation</td>
<td>Some limitation</td>
<td>Extremely limited</td>
</tr>
</tbody>
</table>

**Risk**

Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category.

Relatives annual risk of exacerbations may be related to FEV₁.

---

**Severe Asthma Phenotypes**

- **Cluster 1**: 
  - MAX FEV₁: ≥ 108% 
  - Age of Onset: < 40 yrs

- **Cluster 2**: 
  - MAX FEV₁: < 108% 
  - Age of Onset: ≥ 40 yrs

- **Cluster 3**: 
  - BASELINE FEV₁: ≥ 68%

- **Cluster 4**: 
  - BASELINE FEV₁: < 68%

- **Cluster 5**: 
  - MAX FEV₁: ≥ 65%
### Severe Asthma Phenotypes

![Diagram showing severe asthma phenotypes with percentages and days](image)

Moore et al, AJRCCM 2010

---

### Assessment of Asthma Control

<table>
<thead>
<tr>
<th>Components of control</th>
<th>Classification of asthma control (youths &gt;12 years of age and adults)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well controlled</td>
</tr>
<tr>
<td>Impairment</td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤3/night</td>
</tr>
<tr>
<td>Interference with</td>
<td>None</td>
</tr>
<tr>
<td>normal activity</td>
<td></td>
</tr>
<tr>
<td>Short-acting</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>beta&lt;sub&gt;2&lt;/sub&gt;-agonist use for symptom control (not prevention of EIB)</td>
<td></td>
</tr>
<tr>
<td>FEV&lt;sub&gt;1&lt;/sub&gt; or peak flow</td>
<td>&gt;50 percent predicted/personal best</td>
</tr>
<tr>
<td>Validated questionnaires</td>
<td></td>
</tr>
<tr>
<td>AQLQ</td>
<td>0</td>
</tr>
<tr>
<td>ACT</td>
<td>≥10</td>
</tr>
<tr>
<td>Risk</td>
<td></td>
</tr>
<tr>
<td>Exacerbations</td>
<td>0 to 1/year</td>
</tr>
<tr>
<td>Progressive loss of lung function</td>
<td>Requires long-term follow-up care</td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td>Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.</td>
</tr>
</tbody>
</table>
Factors Affecting Asthma Control

P-A-C-T

- **Perception**
  - Locus of control, cultural

- **Adherence**

- **Comorbidities**
  - GERD, sinus disease, allergic rhinitis

- **Triggers**
  - Tobacco smoke, pets, cockroaches, etc

How to distinguish between uncontrolled and severe asthma

1. Watch patient using their inhaler. Discuss adherence and barriers to use.
2. Confirm the diagnosis of asthma.
5. Refer to a specialist or severe asthma clinic.

- Compare inhaler technique with a device-specific checklist, and correct errors; recheck frequently. Have an empathic discussion about barriers to adherence.
- If lung function normal during symptoms, consider halving ICS dose and repeating lung function after 2–3 weeks.
- Check for risk factors or inducers such as smoking, beta-blockers, NSAIDs, allergen exposure. Check for comorbidities such as rhinitis, obesity, GERD, depression/anxiety.
- Consider step-up to next treatment level. Use shared decision-making, and balance potential benefits and risks.
- If asthma still uncontrolled after 3–6 months on Step 4 treatment, refer for expert advice. Refer earlier if asthma symptoms severe, or doubts about diagnosis.
Intermittent Asthma

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

Step 1
Preferred: Pref. SABA PRN

Step 2
Preferred: Low-dose ICS
Alternative: LTRA Cromolyn, Nedocromil, or Theophylline

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

Step 4
Preferred: Medium-dose ICS + LABA
Alternative: Medium-dose ICS + either LTRA or Theophylline

Step 5
Preferred: High-dose ICS + LABA
Alternative: High-dose ICS + either LTRA or Theophylline
AND Omalizumab may be considered for patients who have allergies

Step 6
Preferred: High-dose ICS + LABA + oral corticosteroid
Alternative: High-dose ICS + either LTRA or Theophylline + oral corticosteroid
AND Omalizumab may be considered for patients who have allergies

Step up if needed (first, check adherence and environmental control and comorbid conditions)

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

Patient Education and Environmental Control at Each Step

EPR 3 - 2007

Stepwise management - pharmacotherapy

- Diagnosis
- Symptom control & risk factors (including lung function)
- Inhaler technique & adherence
- Patient preference

As-needed short-acting beta-agonist (SABA)
Cochrane Review

- Overall, efficient inhaler technique
  - 46-59% did OK
- Mistakes in MDIs
  - 37%
- Mistakes in DPIs
  - 35%
- Switching is a problem
  - 50% loss of control


Adherence

- Compare what the patient answered to asthma meds.
  - Is it the same as what you prescribed?
- Look at comments about why medication is taken
  - Are they taking the right one for the right reason?

  Rescue vs Controller

- Look at comments about why medication is not taken
  - Fear
  - Too expensive
  - Become dependent
  - Too complicated
  - Don’t need it all the time — no symptoms = no asthma
Inhaler Videos Available

- Available on drug company websites
- New ones available on website specifically developed for primary care:
  - You can review
  - Patient can review at home
  - Family can review

Medications to Treat Asthma: Using an MDI

Inhaler technique should be evaluated at each visit — part of medication reconciliation.

Office Spirometers

Asthma Control Assessment is Sparse

Clinicians don’t ask
Patients don’t report
Clinicians don’t document
Treating modifiable risk factors

- Provide skills and support for guided asthma self-management
  - This comprises self-monitoring of symptoms and/or PEF, a written asthma action plan and regular medical review
- Prescribe medications or regimen that minimize exacerbations
  - ICS-containing controller medications reduce risk of exacerbations
- Encourage avoidance of tobacco smoke (active or ETS)
  - Provide smoking cessation advice and resources at every visit
- For patients with severe asthma
  - Refer to a specialist center, if available, for consideration of add-on medications and/or sputum-guided treatment
- For patients with confirmed food allergy:
  - Appropriate food avoidance
  - Ensure availability of injectable epinephrine for anaphylaxis

Non-pharmacological interventions

- Avoidance of tobacco smoke exposure
- Physical activity
- Occupational asthma
  - Ask patients with adult-onset asthma about work history. Remove sensitizers as soon as possible. Refer for expert advice, if available
- Avoid medications that may worsen asthma
  - (Allergen avoidance)
    - (Not recommended as a general strategy for asthma)
Reviewing response and adjusting treatment

- How often should asthma be reviewed?
  - 1-3 months after treatment started, then every 3-12 months
  - During pregnancy, every 4-6 weeks
  - After an exacerbation, within 1 week

- Stepping up asthma treatment
  - **Sustained step-up**, for at least 2-3 months if asthma poorly controlled
    - Important: first check for common causes (symptoms not due to asthma, incorrect inhaler technique, poor adherence)
  - **Short-term step-up**, for 1-2 weeks, e.g. with viral infection or allergen
    - May be initiated by patient with written asthma action plan
  - **Day-to-day adjustment**
    - For patients prescribed low-dose ICS/formoterol maintenance and reliever regimen

- Stepping down asthma treatment
  - Consider step-down after good control maintained for 3 months
  - Find each patient’s minimum effective dose, that controls both symptoms and exacerbations

*Approved only for low dose beclometasone/formoterol and low dose budesonide/formoterol

Managing Asthma:
Sample Asthma Action Plan

Describes medicines to use and actions to take

**General principles for stepping down controller treatment**

- **Aim**
  - To find the lowest dose that controls symptoms and exacerbations, and minimizes the risk of side-effects

- **When to consider stepping down**
  - When symptoms have been well controlled and lung function stable for ≥3 months
  - No respiratory infection, patient not travelling, not pregnant

- **Prepare for step-down**
  - Record the level of symptom control and consider risk factors
  - Make sure the patient has a written asthma action plan
  - Book a follow-up visit in 1-3 months

- **Step down through available formulations**
  - Stepping down ICS doses by 25–50% at 3 month intervals is feasible and safe for most patients
  - See GINA 2015 report Box 3-7 for specific step-down options

- Stopping ICS is not recommended in adults with asthma

---

**Step 1 – as-needed inhaled short-acting beta$_2$-agonist (SABA)**

<table>
<thead>
<tr>
<th>Step</th>
<th>Controller Options</th>
<th>Reliever Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STEP 1</strong></td>
<td>Low dose ICS</td>
<td>As-needed short-acting beta$_2$-agonist (SABA)</td>
</tr>
<tr>
<td><strong>STEP 2</strong></td>
<td>Low dose ICS</td>
<td>Low dose ICS/LABA $^*$</td>
</tr>
<tr>
<td><strong>STEP 3</strong></td>
<td>Med/high dose ICS/LABA $^*$</td>
<td>Low dose ICS/LABA $^*$</td>
</tr>
<tr>
<td><strong>STEP 4</strong></td>
<td>Med/high dose ICS/LABA $^*$</td>
<td>Add long-acting beta$_2$-agonist (LABA) $^*$</td>
</tr>
<tr>
<td><strong>STEP 5</strong></td>
<td>Refer for add-on treatment e.g. anti-IgE</td>
<td>Add oral corticosteroids (OCS)</td>
</tr>
</tbody>
</table>

*For children 6-11 years, theophylline is not recommended, and preferred Step 3 is medium dose ICS
**For patients prescribed BDP/formoterol or BUD/formoterol maintenance and reliever therapy
# Tiotropium by soft-mist inhaler is indicated as add-on treatment for patients with a history of exacerbations; it is not indicated in children <18 years.
### Step 2 – low-dose controller + as-needed inhaled SABA

#### PREFERRED CONTROLLER CHOICE

<table>
<thead>
<tr>
<th>STEP 1</th>
<th>STEP 2</th>
<th>STEP 3</th>
<th>STEP 4</th>
<th>STEP 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low dose ICS</td>
<td>Low dose ICS/LABA*</td>
<td>Med/High ICS/LABA</td>
<td>Add budesonide/High dose ICS + LTRA or a Theophylline</td>
<td>Refer for add-on treatment e.g. anti-IgE</td>
</tr>
<tr>
<td>Leukotriene receptor antagonists (LTRA)</td>
<td>Med/High dose ICS/LABA (or a Theophylline)</td>
<td>Add budesonide/High dose ICS + LTRA or a Theophylline</td>
<td>Add tiotropium Soft Mist Inhaler</td>
<td>Add low dose OCS</td>
</tr>
<tr>
<td>Low dose Theophylline*</td>
<td>As-needed short-acting beta2-agonist (SABA)</td>
<td>As-needed SABA or low dose ICS/formoterol**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**For children 6-11 years, theophylline is not recommended, and preferred Step 3 is medium dose ICS**

**For patients prescribed BDP/formoterol or BUD/formoterol maintenance and reliever therapy**

# Tiotropium by soft-mist inhaler is indicated as add-on treatment for patients with a history of exacerbations; it is not indicated in children <18 years.

---

### Step 2 – Low dose controller + as-needed SABA

- **Preferred option: regular low dose ICS with as-needed inhaled SABA**
  - Low dose ICS reduces symptoms and reduces risk of exacerbations

- **Other options**
  - Leukotriene receptor antagonists (LTRA) with as-needed SABA
    - Less effective than low dose ICS
  - Combination low dose ICS/long-acting beta2-agonist (LABA) with as-needed SABA
    - Reduces symptoms and increases lung function compared with ICS
  - Intermittent ICS with as-needed SABA for purely seasonal allergic asthma with no interval symptoms
    - Start ICS immediately symptoms commence, and continue for 4 weeks after pollen season ends
**Step 3 – one or two controllers + as-needed inhaled reliever**

*For children 6-11 years, theophylline is not recommended, and preferred Step 3 is medium dose ICS

**For patients prescribed BDP/formoterol or BUD/formoterol maintenance and reliever therapy

Tiotropium by soft-mist inhaler is indicated as add-on treatment for patients with a history of exacerbations; it is not indicated in children <18 years.

Other controller options

**RELIEVER**

- As-needed short-acting beta2-agonist (SABA)
- As-needed SABA or low dose ICS/formoterol**

---

**Before considering step-up**

- Check inhaler technique and adherence, confirm diagnosis

**Adults/adolescents: preferred options are either combination low dose ICS/LABA maintenance with as-needed SABA**

- Adding LABA reduces symptoms and exacerbations and increases FEV₁, while allowing lower dose of ICS

**Other options**

- Adults/adolescents: Increase ICS dose or add LTRA or theophylline (less effective than ICS/LABA)
Step 4 – two or more controllers + as-needed inhaled reliever

- Before considering step-up
  - Check inhaler technique and adherence
- Adults or adolescents: preferred option is combination medium dose ICS/LABA with as-needed SABA
- Other options (adults or adolescents)
  - Tiotropium by soft-mist inhaler may be used as add-on therapy for adult patients (≥18 years) with a history of exacerbations
  - Trial of high dose combination ICS/LABA, but little extra benefit and increased risk of side-effects
  - Increase dosing frequency (for budesonide-containing inhalers)
  - Add-on LTRA or low dose theophylline

*For children 6-11 years, theophylline is not recommended, and preferred Step 3 is medium dose ICS
**For patients prescribed BDP/formoterol or BUD/formoterol maintenance and reliever therapy
# Tiotropium by soft-mist inhaler is indicated as add-on treatment for patients with a history of exacerbations; it is not indicated in children <18 years.
Step 5 – higher level care and/or add-on treatment

<table>
<thead>
<tr>
<th>PREFERRED CONTROLLER CHOICE</th>
<th>RELIEVER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STEP 1</strong></td>
<td>Low dose ICS</td>
</tr>
<tr>
<td>Consider low dose ICS</td>
<td>As-needed short-acting beta2-agonist (SABA)</td>
</tr>
<tr>
<td><em>Leukotriene receptor antagonists (LTRA)</em></td>
<td></td>
</tr>
<tr>
<td><strong>STEP 2</strong></td>
<td>Low dose ICS/LABA*</td>
</tr>
<tr>
<td>Low dose ICS</td>
<td>As-needed SABA or low dose ICS/formoterol**</td>
</tr>
<tr>
<td><strong>STEP 3</strong></td>
<td>Med/high dose ICS/LABA</td>
</tr>
<tr>
<td>Med/high dose ICS/LABA*</td>
<td>Ref for add-on treatment e.g. anti-IgE</td>
</tr>
<tr>
<td><strong>STEP 5</strong></td>
<td>Add tiotropium#</td>
</tr>
<tr>
<td><strong>STEP 4</strong></td>
<td>Add tiotropium#</td>
</tr>
</tbody>
</table>

*For children 6-11 years, theophylline is not recommended, and preferred Step 3 is medium dose ICS
**For patients prescribed BDP/formoterol or BUD/formoterol maintenance and reliever therapy
# Tiotropium by soft-mist inhaler is indicated as add-on treatment for patients with a history of exacerbations; it is not indicated in children <18 years.

*Other controller options

**Preferred option is referral for specialist investigation and consideration of add-on treatment

- If symptoms uncontrolled or exacerbations persist despite Step 4 treatment, check inhaler technique and adherence before referring
- Add-on omalizumab (anti-IgE) is suggested for patients with moderate or severe allergic asthma that is uncontrolled on Step 4 treatment

**Other add-on treatment options at Step 5 include:

- Tiotropium: for adults (≥18 years)
- Sputum-guided treatment: this is available in specialized centers;
- Add-on low dose oral corticosteroids (≤7.5mg/day prednisone equivalent): this may benefit some patients, but has significant systemic side-effects. Assess and monitor for osteoporosis
- See Severe Asthma Guidelines (Chung et al, ERJ 2014) for more detail
Approved New Therapies for Severe Asthma

- Omalizumab (Xolair) - 2003 Severe Eosinophilic asthma
- Mepolizumab (Nucala) - 2015 Severe Eosinophilic asthma
- Reslizumab (Cinquair) – 2016 Severe asthma
- Bronchial Thermoplasty – 2010 Severe and persistent asthma not well controlled with ICS and LABA
Mepolizumab in Asthma

Asthma Exacerbations

- Placebo
- Mepolizumab 75 mg, intravenously
- Mepolizumab 100 mg, subcutaneously

Week

Cumulative No.

B FEV₁ (% of predicted value)

- Placebo
- Mepolizumab 75 mg, intravenously
- Mepolizumab 100 mg, subcutaneously

Week
Mepolizumab in Asthma- Steroid Reduction

A Change from Baseline in Glucocorticoid Dose
- Placebo (N=66)
- Mepolizumab (N=69)

Optimized dose
Maintenance dose

International ERS/ATS guidelines on definition, evaluation and treatment of severe asthma

Kian Fan Chung1,2,21, Sally E. Wenzel3,21, Jan L. Brozek4, Andrew Bush1,2, Mario Castro5, Peter J. Sterk6, Ian M. Adcock1, Eric D. Bateman7, Elisabeth H. Bel6, Eugene R. Bleecker6, Louis-Philippe Boulet8, Christopher Brightling9, Pascal Chanez11, Sven-Erik Dahlen12, Ratko Djukanovic13, Urs Frey14, Mina Gagis15, Peter Gibson14, Quatayba Hamid17, Nizar N. Jajour18, Thais Mauad19, Ronald L. Sorkness18 and W. Gerald Teague20

Eur Respir J 2014; 43: 343-373 | DOI: 10.1183/09031936.00202013
Clinical Overlap Between COPD and Asthma

COPD
- Smoking history
- Progressive dyspnea; productive cough
- Bronchodilator response: AC>BA
- Neutrophilic inflammation

Asthma
- Early and/or family history
- Intermittent wheezing; hay fever; atopy
- Bronchodilator response: BA>AC
- Eosinophilic inflammation

AC= Anticholinergic
BA= β2-agonist.

Adapted by Christopher B. Cooper, MD.
Barnes, Chest. 2000;117:10S-14S; Balmes et al, for the American Thoracic Society.
Am J Respir Crit Care Med. 2003;167:787-796.
Figure 1. Hypothetical Course of Lung Function in Chronic Obstructive Pulmonary Disease (COPD) and Asthma.

Figure 2. Risk Factors for Asthma and COPD and the Influence of Environment and Aging.
### Table 1. Four Examples of Patients with Obstructive Airway Disease.*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patient with <em>&quot;Easy&quot;</em> Asthma</th>
<th>Patient with <em>&quot;Easy&quot;</em> COPD</th>
<th>Patient with ACOS Stemming from Asthma</th>
<th>Patient with ACOS Stemming from COPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>21</td>
<td>65</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Atopy</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Current smoker</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Pack-years</td>
<td>0</td>
<td>95</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>Recurrent</td>
<td>Chronic</td>
<td>Chronic with flares</td>
<td>Chronic with flares</td>
</tr>
<tr>
<td>Wheezing</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Reversible airway obstruction</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes or no</td>
</tr>
<tr>
<td>Bronchial hyperresponsiveness</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* "Easy" asthma and "easy" COPD are the easily recognized extremes of asthma and COPD. The two patients with the asthma–COPD overlap syndrome (ACOS) have a similar age, and both have atopy. Despite not being a smoker, the patient with ACOS stemming from asthma has irreversible airway obstruction, which is accompanied by chronic dyspnea and flare-ups of wheezing and bronchial hyperresponsiveness. The patient with ACOS stemming from COPD has some reversibility of airway obstruction after bronchodilator use, chronic dyspnea, and flare-ups of wheezing, which may or may not be accompanied by hyperresponsiveness. In the two patients with ACOS, whether the syndrome stems from asthma or from COPD cannot be easily distinguished by their phenotype.

### STEP 2  SYNDROMIC DIAGNOSIS IN ADULTS
1. Assemble the features for asthma and for COPD that best describe the patient.
2. Compare number of features in favour of each diagnosis and select a diagnosis

<table>
<thead>
<tr>
<th>Feature: if present suggests</th>
<th><strong>ASTHMA</strong></th>
<th><strong>COPD</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of onset:</td>
<td>Before age 20 years</td>
<td>After age 40 years</td>
</tr>
<tr>
<td>Pattern of symptoms</td>
<td>Variable over minutes, hours or days</td>
<td>Persistent daily treatment</td>
</tr>
<tr>
<td></td>
<td>More during the night or early morning</td>
<td>Good and bad days but always daily symptoms and morning cough</td>
</tr>
<tr>
<td></td>
<td>Tapered by exercise, emotions including laughter, dust or exposure to allergens</td>
<td>Chronic cough &amp; sputum preceded onset of disease, unrelated to triggers</td>
</tr>
<tr>
<td>Lung function</td>
<td>Record of variable airflow limitation (spirometry or peak flow)</td>
<td>Record of persistent airflow limitation (FEV₁/FVC = 0.7 post-BO)</td>
</tr>
<tr>
<td>Lung function between symptoms</td>
<td>Normal</td>
<td>Abnormal</td>
</tr>
<tr>
<td>Past history or family history</td>
<td>Previous doctor diagnosis of asthma</td>
<td>Previous doctor diagnosis of COPD, chronic bronchitis or emphysema</td>
</tr>
<tr>
<td></td>
<td>Family history of asthma, and other allergic conditions (allergic rhinitis or eczema)</td>
<td>Family history of asthma, and other allergic conditions (allergic rhinitis or eczema)</td>
</tr>
<tr>
<td>Time course</td>
<td>No worsening of symptoms over time, variation in symptoms either seasonally or from year to year</td>
<td>Symptoms slowly worsening over time (progressive course over years)</td>
</tr>
<tr>
<td></td>
<td>May improve spontaneously or have an immediate response to bronchodilators or to iCS over weeks</td>
<td>Rapid acting bronchodilator treatment provides only limited relief</td>
</tr>
<tr>
<td>Chest X-ray</td>
<td>Normal</td>
<td>Severe hypoplasia</td>
</tr>
</tbody>
</table>

**NOTE:** These features best distinguish between asthma and COPD. "Large positive features" = or more for either asthma or COPD are consistent with that diagnosis. If there are a similar number for both asthma and COPD, consider diagnosis of ACOS.

**DIAGNOSIS**
- Asthma: Some features of asthma
- COPD: Some features of COPD

**CONFIDENCE IN DIAGNOSIS**
- Asthma: Possible asthma
- COPD: Could be ACOS
- COPD: Possibly COPD
- COPD: COPD
Summary

- Asthma is a complex group of diseases with multiple phenotypes and treatments
- Asthma severity is an intrinsic characteristic that guides therapy
- Asthma control can be influenced by a number of important modifiable factors
- Asthma and COPD can coexist in a significant proportion of patients.