Relevance to Population: Asthma is a chronic inflammatory disease of the airways affecting 22 million people in the U.S. with increasing prevalence, mortality and cost of care. Asthma is the most common chronic disease of children affecting approximately 6 million children¹ and the leading cause of school absenteeism, accounting for more than 14 million lost school days according to the American Lung Association. It is also the leading cause of work loss for adults, accounting for an estimated 14.5 million lost work days each year. Asthma affects proportionately more children than adults, more women than men, more nonwhites than whites and those residing in the Northeast compared with those residing in other regions.² The prevalence rate for asthma at UPMC Health Plan was nearly 1.0 percent for all products and 2.06 percent for Medicaid members in 2008.

Population Covered by Guideline: All members with Asthma.

Clinical Indicators Measured by UPMC Health Plan:
1. Use of Appropriate Medications for People with Asthma. HEDIS®
2. Percentage of people with Asthma on appropriate medication and who are also on inhaled corticosteroids.
3. Percentage of people with a diagnosis of Asthma who have had a spirometry test within the last 12 months.

Additional HEDIS® Measures for Respiratory Conditions
- Appropriate Treatment for Children with Upper Respiratory Infection
- Appropriate Testing for Children with Pharyngitis
- Avoidance of Antibiotic Treatment in Adults with Acute Bronchitis

Key Points:
- Airway inflammation contributes to hyperresponsive airways, airflow limitation, respiratory symptoms, and disease chronicity.
- Viral respiratory infections are one of the most important causes of asthma exacerbation.
- Use of Asthma Action Plan containing the following written information:
  - Details on how the patient should monitor his or her asthma, either by symptoms or peak flow monitoring
  - List of medications patient should take, described either as daily controllers taken routinely or quick relief medications taken as needed for symptoms or to prevent exercise-induced asthma.
  - If asthma symptoms and or peak flow readings are worsening, and/or previous medications are no longer effective, then the member should call his or her physician immediately or go to the emergency room.

The current Full Asthma Guideline is available at [http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm](http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm).

Goal of Asthma Management: To maintain long-term monitoring and control of asthma with minimal adverse effects by using optimal asthma education and therapy.

Asthma Diagnosis: History, Physical Examination, and Spirometry measurement demonstrating:
- Episodic symptoms of airflow obstruction/airway hyperresponsiveness: breathlessness, wheezing, coughing, and chest tightness.
- Spirometry, performed pre- and post-bronchodilator, to confirm evidence of airflow obstruction that is at least partially reversible in adults and children ≥ 5 years old.
- Exclusion of other diagnoses: foreign body, Cystic Fibrosis, vocal cord dysfunction, tracheomalacia, COPD, CHF, PE, tumor, GERD, medications.
- Allergy testing such as Skin and RAST (RadioAllergoSorbent Test) can help identify risk factors that may cause asthma symptoms in individual patients.
- For suspected asthma with normal spirometry, bronchoprovocation (methacholine, histamine, cold air, or exercise) may be useful.

Spirometry Measurement:
- Objective assessment of pulmonary function using spirometry to measure FEV1, FVC (or FEV6), and FEV1/FVC pre- and post-bronchodilator is necessary for the diagnosis of asthma.
  - Reversibility is defined as an increase in post-bronchodilator FEV1 ≥ 12% from baseline or ≥ 10% of predicted FEV1.
• Spirometry measures should be followed over the patient’s lifetime to detect decline of pulmonary function.
  ✓ Spirometry frequency (NHLBI Expert Panel 2007)
    ➢ At the time of initial assessment
    ➢ After treatment initiated and patient stabilized (to document attainment of near normal airway function)
    ➢ During periods of progressive loss of asthma control
    ➢ At least every 1-2 years to assess maintenance of airway function

• Office-based physicians who care for asthma patients should have access to spirometry for asthma diagnosis and monitoring.
• For children, FEV1/FVC appears to be a more sensitive measure of severity; FEV1 is useful to assess risk of exacerbations.
  http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf; refer to section 3.

Components of Asthma Management:
• Measures of Assessment and Monitoring: Patient history, physical exam, and objective tests to diagnose, assess, and monitor the level of asthma control. Classify asthma severity using measures in the following 2 domains:
  ✓ Impairment (symptoms over the previous 2 to 4 weeks)
  ✓ Risk (frequency and intensity of exacerbations)
• Education for a Partnership in Asthma (Teach asthma self-management skills to promote asthma control):
  ✓ Educate and encourage patients to recognize early signs of worsening asthma and to take prompt action.
  ✓ Teach self-monitoring, which is important to the self-management of asthma (either symptom-based or peak-flow monitoring, if taught and followed correctly, may be equally effective).
  ✓ Asthma education must be reinforced frequently.
  ✓ Clinicians should give all asthma patients a written action plan for daily management and symptom worsening.
• Control Environmental Factors and Comorbid Conditions that Affect Asthma: avoid tobacco smoke exposure.
• Pharmacotherapy for Asthma – general points:
  ✓ Acute symptom management: Short-acting Beta-agonist (SABA) meds act rapidly to relax bronchial smooth muscle and are preferred for relief of acute symptoms and prevention of exercise-induced asthma.
  ✓ Long-term asthma control: Controller meds that reduce airway inflammation and prevent bronchoconstriction are most effective to achieve and maintain good control and should be taken long-term on a daily basis.
    ➢ Inhaled Corticosteroids (ICS) are the most effective and the preferred long-acting controllers for mild, moderate, and severe persistent asthma; they are generally safe and well tolerated at moderate doses.
    ➢ Asthma that is not controlled with low to moderate doses ICS may benefit from the addition of a Long-acting Beta-agonist (LABA)
      ➢ Long-acting Beta-agonist (LABA) monotherapy has been linked to fatal asthma attacks and should not be used for asthma control without an ICS.
      ➢ If a LABA is not used or effective in conjunction with an ICS, a leukotriene modifier or theophylline can also be used in combination with an ICS.

Management of Asthma Exacerbations
• Initial Evaluation: Assess symptoms and vital signs. In the absence of impending respiratory failure, spirometry with both inspiratory and expiratory loops should be done to assess baseline level of obstruction and differentiate acute asthma from vocal cord dysfunction or hyperventilation. These measures can also be performed after initial treatment with a SABA if the assessment is limited by patient discomfort.
• Initial Management: Inhaled SABA every 20 minutes. Systemic (usually oral) corticosteroids should be utilized in all but the most mild exacerbations, and IV corticosteroids should be considered when the FEV1 is <40% predicted.
• Discharge Management: Patients who receive systemic corticosteroids in the ED should be given a course of oral corticosteroids on discharge. If not already on an ICS, the patient should be given a prescription for an ICS, instructed in its use, and a follow-up appointment scheduled with a specialist in asthma or with their primary care physician.
Assess Severity
- Patients at high risk for a fatal attack (see figure 5–2a) require immediate medical attention after initial treatment.
- Symptoms and signs suggestive of a more serious exacerbation such as marked breathlessness, inability to speak more than short phrases, use of accessory muscles, or drowsiness (see figure 5–3) should result in initial treatment while immediately consulting with a clinician.
- Less severe signs and symptoms can be treated initially with assessment of response to therapy and further steps as listed below.
- If available, measure PEF—values of 50–75% predicted or personal best indicate the need for quick-relief medication. Depending on the response to treatment, contact with a clinician may also be indicated. Values below 50% indicate the need for immediate medical care.

Initial Treatment
- Inhaled SABA: up to two treatments 20 minutes apart of 2–6 puffs by metered-dose inhaler (MDI) or nebulizer treatments.
- Note: Medication delivery is highly variable. Children and individuals who have exacerbations of lesser severity may need fewer puffs than suggested above.

Good Response
- No wheezing or dyspnea (assess tachypnea in young children).
- PEF ≥80% predicted or personal best.
- Contact clinician for followup instructions and further management.
- May continue inhaled SABA every 3–4 hours for 24–48 hours.
- Consider short course of oral systemic corticosteroids.

Incomplete Response
- Persistent wheezing and dyspnea (tachypnea).
- PEF 50–79% predicted or personal best.
- Add oral systemic corticosteroid.
- Continue inhaled SABA.
- Contact clinician urgently (this day) for further instruction.

Poor Response
- Marked wheezing and dyspnea. PEF <50% predicted or personal best.
- Add oral systemic corticosteroid.
- Repeat inhaled SABA immediately.
- If distress is severe and nonresponsive to initial treatment:
  - Call your doctor AND
  - PROCEED TO ED;
  - Consider calling 9–1–1 (ambulance transport).
  - To ED.

Key: ED, emergency department; MDI, metered-dose inhaler; PEF, peak expiratory flow; SABA, short-acting beta2-agonist (quick-relief inhaler)

### FIGURE 5-6. MANAGEMENT OF ASTHMA EXACERBATIONS: EMERGENCY DEPARTMENT AND HOSPITAL-BASED CARE

**Initial Assessment** (see figures 5-1, 5-3)
- Brief history, physical examination (auscultation, use of accessory muscles, heart rate, respiratory rate), PEF or FEV1, oxygen saturation, and other tests as indicated

- **FEV1 or PEF 80-94% (Mild to Moderate)**
  - Oxygen to achieve SaO2 >90%
  - Inhaled SABA by nebulizer or MDI with valved holding chamber, up to 3 doses in 1 hour
  - Oral systemic corticosteroids if no immediate response or if patient recently took oral systemic corticosteroids

- **FEV1 or PEF <40% (Severe)**
  - Oxygen to achieve SaO2 >90%
  - High-dose inhaled SABA plus ipratropium by nebulizer or MDI plus valved holding chamber, every 20 minutes or continuously for 1 hour
  - Oral systemic corticosteroids

**Impending or Actual Respiratory Arrest**
- Intubation and mechanical ventilation with 100% oxygen
- Nebulized SABA and ipratropium
- Intravenous corticosteroids
- Consider adjunct therapies

**Repeat Assessment**
- Symptoms, physical examination, PEF, SaO2 saturation, other tests as needed

**Admit to Hospital Intensive Care** (see box below)

**Moderate Exacerbation**
- **PEF or PEF 95-100% predicted/personal best**
  - Physical exam: moderate symptoms
  - Inhaled SABA every 15 minutes
  - Oral systemic corticosteroids
  - Continuous treatment 1-3 hours, provided there is improvement; make admission decision in 4-6 hours

**Severe Exacerbation**
- **PEF or PEF <50% predicted/personal best**
  - Physical exam: severe symptoms at rest, accessory muscle use, chest retraction
  - History: high-risk patient
  - No improvement after initial treatment
  - Oxygen 1-3 hours
  - Nebulized SABA + ipratropium, hourly or continuous
  - Oral systemic corticosteroids
  - Consider adjunct therapies

**Good Response**
- FEV1 or PEF 25-74%
- Response sustained 24 minutes after last treatment
- Nocturnal
- Physical exam: normal

**Incomplete Response**
- FEV1 or PEF 40-64%
- Mild-to-moderate symptoms

**Poor Response**
- FEV1 or PEF <40%
- Moderate-to-severe symptoms

**Discharge Home**
- Continue treatment with inhaled SABA
- Continue course of oral systemic corticosteroids
- Consider initiation of an ICS
- Patient education
  - Review medications, including inhaled technique
  - Review/Initiate action plan
  - Recommend close medical follow-up

**Admit to Hospital Ward**
- **Oxygen**
- Inhaled SABA
- Systemic (oral or intravenous) corticosteroids
- Consider adjunct therapies
- Monitor vital signs, FEV1, or PEF, SaO2

**Admit to Hospital Intensive Care**
- **Oxygen**
- Nebulized SABA hourly or continuously
- Intravenous corticosteroids
- Consider adjunct therapies
- Possible intubation and mechanical ventilation

**Discharge Home**
- Continue treatment with inhaled SABAs
- Continue course of oral systemic corticosteroids
- Continue on ICS (For those not on long-term control therapy, consider initiation of an ICS)
- Patient education (e.g., review medications, including inhaler techniques and, whenever possible, environmental control measures; review/Initiate action plan, recommend close medical follow-up)
- Before discharge, schedule follow-up appointment with primary care provider and/or asthma specialist in 1-4 weeks

---

Clinical practice guidelines are designed to assist clinicians by providing a framework for the evaluation and treatment of patients. The asthma guideline is based on the most current recommendations from the National Institutes of Health, National Heart, Lung, and Blood Institute, Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, Full Report 2007 (the current full Asthma Guideline is available at http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm).

Additional Resources for UPMC Health Plan patients
• MyHealth Advice Line is staffed by experienced Registered Nurses and is available 24/7 to provide telephone support to members. Call 1-866-918-1591.

• Health Coach Programs provide intensive case management for members with specific chronic illnesses or conditions. The programs are built upon best practices and accepted clinical guidelines and include:
  - Diabetes
  - Asthma/COPD
  - Cardiovascular
    - Heart failure
    - Coronary artery disease
    - Hypertension
    - Hyperlipidemia
  - Depression

Members and providers can obtain additional information about the health coach programs by calling 1-866-778-6073.

• Online interactive preventive health programs and resources are available at www.upmchealthplan.com.
  - Ready, Set, Stop! Online — smoking cessation program
  - LEAP — fitness program
  - Nutrition center


Scientific Evidence Sources: