**Asthma Algorithm**

Please review definition and pathophysiology

**Assess for the presence of risk factors**
- Altered immunity or adaptive response (history of atopy)
- Family history of asthma
- Exposure to airborne allergens
- Frequent respiratory infections
- Tobacco smoke
- Pollution
- Occupational irritants

*Expert Panel Report 3 (EPR 3): Guidelines for the Diagnosis and Management of Asthma*

Monitor for key indicators of asthma:
- Recurrent wheezing
- Cough especially at night
- Recurrent chest tightness
- Recurrent difficulty breathing "It's like breathing through a straw"
- Symptoms exacerbated by triggers
- Symptoms worse at night

Initiate client education for Health Seeking Behaviors to identify:
- Risk factors see fig 2-4 below
- Signs and symptoms for early detection of disease see figure 3-1 below

Are positive findings present?

Initiate the plan of care for a Risk for Ineffective Therapeutic Regimen management:
- Disease management see fig 3-13
- How to use MDI fig 3-14
- Avoidance of triggers fig 3-15
- Periodic assessment fig 3-7
- Review asthma action plan fig 3-10a
- Review home treatment of attacks fig 5-4
- Review Emergency management of attacks see fig 5-6
- Review discharge checklist fig 5-8

Are positive findings present?

Are acute signs and symptoms of tracheobronchial constriction present?

Follow plan of care for acute tracheobronchial constriction see fig 5-6 see page 13
**Collaborative Problem**

**OUTCOMES/BENCHMARKS:**
No breathlessness, coughing or wheezing. Lungs CTA, Peak flow in green zone; 80 percent to 100 percent of personal best
Able to perform ADL
Triggers controlled

---

**PC: Exacerbation of asthma (Tracheobronchial constriction)**

<table>
<thead>
<tr>
<th>ASSESS s/s of exacerbation of asthma</th>
<th>Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cough</td>
<td>Monitor peak flow result and correlate to asthma action plan</td>
</tr>
<tr>
<td>• Wheezing</td>
<td>Administer rescue inhaler/nebulizer treatment if indicated according to plan.</td>
</tr>
<tr>
<td>• Shortness of breath</td>
<td>Mon Pulse oximetry; if less than 90% follow plan of care for PC hypoxia</td>
</tr>
<tr>
<td>• Chest tightness</td>
<td>Monitor chest Xray results for evidence of air trapping and isolation of infection</td>
</tr>
<tr>
<td>• Sputum production</td>
<td>Monitor sputum culture results</td>
</tr>
<tr>
<td>• Decreased exercise tolerance</td>
<td>Monitor CBC for left shift and leukocytosis</td>
</tr>
<tr>
<td>Of sudden onset associated with exposure to a trigger</td>
<td>Monitor for eosinophilia indicating allergic triggers</td>
</tr>
</tbody>
</table>

**Assess for contributing factors:**

- infection
- Allergens/environmental factors
- Occupation
- Medications
- Exercise
- Emotional stress

**Monitor for complications**

Monitor for s/s of status asthmaticus

---

**DO**

**Stop tracheobronchial constriction:**
Administer short acting beta agonists according to asthma action plan
Anti-inflammatory agents according to step wise approach
Methylxanthines may be administered in severe exacerbations although their use is controversial
Anticholinergic agents can be considered in severe exacerbation
Leukotriene inhibitors, mast cell stabilizer, and monoclonal antibodies may be administered as ordered

**Improve gas exchange**
Provide supplemental oxygen therapy
Teach pursed lip breathing
Position HOB elevated

**Treat contributing factors**
Administer prescribed antibiotics according to culture report
Control environmental triggers
Review medication record for identification of potential triggers
Implement activities to minimize activity intolerance

---

**CALL**

- Rapidly worsening asthma or a lack of response to the initial therapy
- If patients have confusion, drowsiness, signs of impending respiratory arrest, or loss of consciousness
- hypoxemia (PO\textsubscript{2} <60 mm Hg) despite supplemental oxygen and/or hypercarbia with PCO\textsubscript{2} greater than 45 mm Hg

initiate airway/ventilation management and call Ready response team & MD

---

**OUTCOMES/BENCHMARKS:**
No breathlessness, coughing or wheezing. Lungs CTA, Peak flow in green zone; 80 percent to 100 percent of personal best
Able to perform ADL
Triggers controlled
Collaborative Problem

OUTCOMES/BENCHMARKS:
Alert and oriented X 3  
Respirations even and unlabored, No complaints of chest discomfort  
Skin pink, warm and dry  
Pulse oximetry > 90-95% based on history

<table>
<thead>
<tr>
<th>PC: hypoxia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSESS s/s of exacerbation of asthma</strong></td>
</tr>
</tbody>
</table>
| • impaired consciousness, change in mental status  
  • Shortness of breath  
  • Chest tightness  
  • Adventitious breath sounds  
  • Cyanosis, skin color changes |
| **Assess for contributing factors:** |
| • Lung disease: asthma, COPD  
  • Lung infection  
  • Cardiac disease  
  • Advancing age  
  • CNS/PNS disorders  
  • Hematologic disorders |
| **Monitor** |
| Monitor Pulse oximetry; if less than 90% perform ABG analysis to evaluate for acid base imbalance  
  Respiratory alkalosis may be present in early hypoxemia especially in asthma clients followed by acidosis  
  Hypoxemia and acidosis is an ominous sign and requires immediate intervention  
  Mon chest Xray results for evidence of air trapping and isolation of infection, evidence of cardiac condition  
  Monitor sputum culture results  
  Monitor CBC for left shift and leukocytosis, anemia |

<table>
<thead>
<tr>
<th>PC: Hypoxia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DO</strong></td>
</tr>
</tbody>
</table>
| Maintain airway:  
  Ensure adequate airway. If client is unable to maintain patent airway call ready response team  
  Position client to support airway  
  Suction client to clear airway of secretions |
| Restore ventilation and Improve gas exchange  
  Assist ventilate client if spontaneous respirations are inadequate to maintain tissue perfusion  
  Administer bronchodilators as prescribed if wheezing is present  
  Provide supplemental oxygen therapy and monitor effectiveness  
  Position HOB elevated  
  If client is conscious and able to follow instructions, teach pursed lip breathing |
| Treat contributing factors  
  Treat the underlying cause |
| **CALL** |
| • If client is unable to maintain patient airway, pulse oximetry > 90 % (88% on COPD clients and is experiencing s/s of hypoxia refractory to treatment  
  initiate airway/ventilation management, noninvasive hemodynamic monitoring and call Ready response team & MD |
FIGURE 2–4. HOST FACTORS AND ENVIRONMENTAL EXPOSURES

- Genetic Factors
  - Cytokine response profiles
- Environment
  - Allergens
  - Pollution
  - Infections
  - Microbes
  - Stress

Altered Innate and Adaptive Immune Responses

Lower Airway Targeting

LRI - RSV/PIV
- Adenovirus
- Chlamydia
- Mycoplasma

Persistent wheezing and asthma

Key: LRI, lower respiratory illnesses; RSV, respiratory syncytial virus; PIV, parainfluenza virus

Fig 5-2a

FIGURE 5–2. RISK FACTORS FOR DEATH FROM ASTHMA

Asthma history
- Previous severe exacerbation (e.g., intubation or ICU admission for asthma)
- Two or more hospitalizations for asthma in the past year
- Three or more ED visits for asthma in the past year
- Hospitalization or ED visit for asthma in the past month
- Using >2 canisters of SABA per month
- Difficulty perceiving asthma symptoms or severity of exacerbations
- Other risk factors: lack of a written asthma action plan, sensitivity to Alternaria

Social history
- Low socioeconomic status or inner-city residence
- Illicit drug use
- Major psychosocial problems

Comorbidities
- Cardiovascular disease
- Other chronic lung disease
- Chronic psychiatric disease

Key: ED, emergency department; ICU, intensive care unit; SABA, short-acting beta₂-agonist

Retrieved from Expert Panel Report 3 (EPR 3): Guidelines for the Diagnosis and Management of Asthma
BOX 3-1. KEY INDICATORS FOR CONSIDERING A DIAGNOSIS OF ASTHMA

Consider a diagnosis of asthma and performing spirometry if any of these indicators is present.* These indicators are not diagnostic by themselves, but the presence of multiple key indicators increases the probability of a diagnosis of asthma. Spirometry is needed to establish a diagnosis of asthma.

- Wheezing—high-pitched whistling sounds when breathing out—especially in children. (Lack of wheezing and a normal chest examination do not exclude asthma.)

- History of any of the following:
  - Cough, worse particularly at night
  - Recurrent wheeze
  - Recurrent difficulty in breathing
  - Recurrent chest tightness

- Symptoms occur or worsen in the presence of:
  - Exercise
  - Viral infection
  - Animals with fur or hair
  - House-dust mites (in mattresses, pillows, upholstered furniture, carpets)
  - Mold
  - Smoke (tobacco, wood)
  - Pollen
  - Changes in weather
  - Strong emotional expression (laughing or crying hard)
  - Airborne chemicals or dusts
  - Menstrual cycles

- Symptoms occur or worsen at night, awakening the patient.

*Eczema, hay fever, or a family history of asthma or atopic diseases are often associated with asthma, but they are not key indicators.

Retrieved from Expert Panel Report 3 (EPR 3): Guidelines for the Diagnosis and Management of Asthma
### FIGURE 3-13. DELIVERY OF ASTHMA EDUCATION BY CLINICIANS DURING PATIENT CARE VISITS

<table>
<thead>
<tr>
<th>Assessment Questions</th>
<th>Information</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus on:</strong></td>
<td><strong>Teach in simple language:</strong></td>
<td><strong>Teach or review and demonstrate:</strong></td>
</tr>
<tr>
<td>◇ Expectations of visit</td>
<td>◇ What is asthma? Asthma is a chronic lung disease. The airways are very sensitive. They become inflamed and narrow; breathing becomes difficult.</td>
<td>◇ Inhaler (see figure 3-14) and spacer or valved holding chamber (VHC) use. Check performance.</td>
</tr>
<tr>
<td>◇ Asthma control</td>
<td>◇ The definition of asthma control: few nighttime symptoms, no nighttime awakenings due to asthma, able to engage in normal activities, normal lung function.</td>
<td>◇ Self-monitoring skills that are tied to a written action plan:</td>
</tr>
<tr>
<td>◇ Patients' goals of treatment</td>
<td>◇ Asthma treatments: two types of medicines are needed:</td>
<td>◇ Recognize intensity and frequency of asthma symptoms.</td>
</tr>
<tr>
<td>◇ Medications</td>
<td>◇ Long-term control: medications that prevent symptoms, often by reducing inflammation.</td>
<td>◇ Review the signs of deterioration and the need to reevaluate therapy:</td>
</tr>
<tr>
<td>◇ Quality of life</td>
<td>◇ Quick relief: short-acting bronchodilator relaxes muscles around airways.</td>
<td>◦ Waking at night or early morning with asthma</td>
</tr>
<tr>
<td>“What worries you most about your asthma?”</td>
<td>◇ Bring all medications to every appointment.</td>
<td>◦ Increased medication use</td>
</tr>
<tr>
<td>“What do you want to accomplish at this visit?”</td>
<td>◇ When to seek medical advice. Provide appropriate telephone number.</td>
<td>◦ Decreased activity tolerance</td>
</tr>
<tr>
<td>“What do you want to be able to do that you can’t do now because of your asthma?”</td>
<td></td>
<td>◇ Use of a written asthma action plan (See figure 3-13.) that includes instructions for daily management and for recognizing and handling worsening asthma.</td>
</tr>
<tr>
<td>“What do you expect from treatment?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“What medicines have you tried?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“What other questions do you have for me today?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Are there things in your environment that make your asthma worse?”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Recommendations for Initial Visit**

**Focus on:**
- Expectations of visit
- Asthma control
- Patients’ goals of treatment
- Medications
- Patient treatment preferences
- Quality of life

Ask relevant questions from previous visit and also ask:
- “What medications are you taking?”
- “How and when are you taking them?”
- “What problems have you had using your medications?”
- “Please show me how you use your inhaled medications.”

### Recommendations for First Followup Visit (2 to 4 weeks or sooner as needed)

**Focus on:**
- Expectations of visit
- Asthma control
- Patients’ goals of treatment
- Medications
- Patient treatment preferences
- Quality of life

Ask relevant questions from previous visit and also ask:
- “What medications are you taking?”
- “How and when are you taking them?”
- “What problems have you had using your medications?”
- “Please show me how you use your inhaled medications.”

**Teach in simple language:**
- Use of two types of medications.
- Remind patient to bring all medications and the peak flow meter, if using, to every appointment for review.
- Self-assessment of asthma control using symptoms and/or peak flow as a guide.

**Teach or review and demonstrate:**
- Use of written asthma action plan. Review and adjust as needed.
- Peak flow monitoring if indicated (See figure 3-11.).
- Correct inhaler and spacer or VHC technique.
FIGURE 3-14. HOW TO USE YOUR METERED-DOSE INHALER

HOW TO USE YOUR METERED-DOSE INHALER

Using an inhaler seems simple, but most patients do not use it the right way. When you use your inhaler the wrong way, less medicine gets to your lungs.

For the next few days, read these steps aloud as you do them or ask someone to read them to you. Ask your doctor or nurse to check how well you are using your inhaler.

Use your inhaler in one of the three ways pictured below. A or B are best, but C can be used if you have trouble with A and B. Your doctor may give you other types of inhalers.

Steps for Using Your Inhaler

Getting ready
1. Take off the cap and shake the inhaler.
2. Breathe out all the way.
3. Hold your inhaler the way your doctor said (A, B, or C below).

Breathe in slowly
4. As you start breathing in slowly through your mouth, press down on the inhaler one time. (If you use a holding chamber, first press down on the inhaler. Within 5 seconds, begin to breathe in slowly.)
5. Keep breathing in slowly, as deeply as you can.
6. Hold your breath as you count to 10 slowly, if you can.
7. For inhaled quick-relief medicine (beta2-agonists), wait about 15–30 seconds between puffs. There is no need to wait between puffs for other medicines.

Hold your breath

A. Hold inhaler 1 to 2 inches in front of your mouth (about the width of two fingers).
B. Use a spacer/holding chamber. These come in many shapes and can be useful to any patient.
C. Put the inhaler in your mouth. Do not use for steroids.

Clean your inhaler as needed, and know when to replace your inhaler. For instructions, read the package insert or talk to your doctor, other health care provider, or pharmacist.

Retrieved from Expert Panel Report 3 (EPR 3): Guidelines for the Diagnosis and Management of Asthma
**FIGURE 3-15. HOW TO CONTROL THINGS THAT MAKE YOUR ASTHMA WORSE**

You can help prevent asthma episodes by staying away from things that make your asthma worse. This guide suggests many ways to help you do this.

You need to find out what makes your asthma worse. Some things that make asthma worse for some people are not a problem for others. You do not need to do all of the things listed in this guide.

Look at the things listed in dark print below. Put a check next to the ones that you know make your asthma worse, particularly if you are allergic to the things. Then, decide with your doctor what steps you will take. Start with the things in your bedroom that bother your asthma. Try something simple first.

**Tobacco Smoke**

- If you smoke, ask your doctor for ways to help you quit. Ask family members to quit smoking, too.
- Do not allow smoking in your home, car, or around you.
- Be sure no one smokes at a child's daycare center or school.

**Dust Mites**

Many people who have asthma are allergic to dust mites. Dust mites are like tiny "bugs" you cannot see that live in cloth or carpet.

Things that will help the most:

- Encase your mattress in a special dust mite-proof cover.*
- Encase your pillow in a special dust mite-proof cover* or wash the pillow each week in hot water. Water must be hotter than 130 °F to kill the mites. Cooler water used with detergent and bleach can also be effective.
- Wash the sheets and blankets on your bed each week in hot water.

Other things that can help:

- Reduce indoor humidity to or below 60 percent; ideally 30–50 percent. Dehumidifiers or central air conditioners can do this.
- Try not to sleep or lie on cloth-covered cushions or furniture.
- Remove carpets from your bedroom and those laid on concrete, if you can.
- Keep stuffed toys out of the bed, or wash the toys weekly in hot water or in cooler water with detergent and bleach. Placing toys weekly in a dryer or freezer may help. Prolonged exposure to dry heat or freezing can kill mites but does not remove allergen.

*To find out where to get products mentioned in this guide, call:

Asthma and Allergy Foundation of America
(800–727–8462)

American Academy of Allergy, Asthma, and Immunology
(800–822–2762)

Allergy and Asthma Network/Mothers of Asthmatics, Inc. (800–878–4403)

National Jewish Medical and Research Center
(Lung Line) (800–222–5864)

American College of Allergy, Asthma, and Immunology
(800–842–7777)
**Figure 3-15. How to Control Things That Make Your Asthma Worse (continued)**

<table>
<thead>
<tr>
<th>Animal Dander</th>
<th>Pollen and Outdoor Mold</th>
</tr>
</thead>
</table>
| Some people are allergic to the flakes of skin or dried saliva from animals. The best thing to do:  
- Keep animals with fur or hair out of your home.  
If you can't keep the pet outdoors, then:  
- Keep the pet out of your bedroom, and keep the bedroom door closed.  
- Remove carpets and furniture covered with cloth from your home. If that is not possible, keep the pet out of the rooms where these are. | During your allergy season (when pollen or mold spore counts are high):  
- Try to keep your windows closed.  
- If possible, stay indoors with windows closed during the midday and afternoon, if you can. Pollen and some mold spore counts are highest at that time.  
- Ask your doctor whether you need to take or increase anti-inflammatory medicine before your allergy season starts. |

<table>
<thead>
<tr>
<th>Cockroach</th>
<th>Smoke, Strong Odors, and Sprays</th>
</tr>
</thead>
</table>
| Many people with asthma are allergic to the dried droppings and remains of cockroaches.  
- Keep all food out of your bedroom.  
- Keep food and garbage in closed containers (never leave food out).  
- Use poison baits, powders, gels, or paste (for example, boric acid). You can also use traps.  
- If a spray is used to kill roaches, stay out of the room until the odor goes away. | If possible, do not use a wood-burning stove, kerosene heater, fireplace, unvented gas stove, or heater.  
- Try to stay away from strong odors and sprays, such as perfume, talcum powder, hair spray, paints, new carpet, or particle board. |

<table>
<thead>
<tr>
<th>Vacuum Cleaning</th>
<th>Exercise or Sports</th>
</tr>
</thead>
</table>
| Try to get someone else to vacuum for you once or twice a week, if you can. Stay out of rooms while they are being vacuumed and for a short while afterward.  
- If you vacuum, use a dust mask (from a hardware store), a central cleaner with the collecting bag outside the home, or a vacuum cleaner with a HEPA filter or a double-layered bag.* | You should be able to be active without symptoms. See your doctor if you have asthma symptoms when you are active—such as when you exercise, do sports, play, or work hard.  
- Ask your doctor about taking medicine before you exercise to prevent symptoms.  
- Warm up for a period before you exercise.  
- Check the air quality index and try not to work or play hard outside when the air pollution or pollen levels (if you are allergic to the pollen) are high. |

<table>
<thead>
<tr>
<th>Indoor Mold</th>
<th>Other Things That Can Make Asthma Worse</th>
</tr>
</thead>
</table>
| Fix leaking faucets, pipes, or other sources of water.  
- Clean moldy surfaces.  
- Dehumidify basements if possible. | Sulfites in foods: Do not drink beer or wine or eat shrimp, dried fruit, or processed potatoes if they cause asthma symptoms.  
- Cold air: Cover your nose and mouth with a scarf on cold or windy days.  
- Other medicines: Tell your doctor about all the medicines you may take. Include cold medicines, aspirin, and even eye drops. |

Retrieved from Expert Panel Report 3 (EPR 3): Guidelines for the Diagnosis and Management of Asthma
**FIGURE 3-7. COMPONENTS OF THE CLINICIAN’S FOLLOWUP ASSESSMENT: SAMPLE ROUTINE CLINICAL ASSESSMENT QUESTIONS**

<table>
<thead>
<tr>
<th>Monitoring Signs and Symptoms</th>
<th>Monitoring Pharmacotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(Global assessment)</em> “Has your asthma been better or worse since your last visit?”</td>
<td><strong>Medications</strong></td>
</tr>
<tr>
<td>“Has your asthma worsened during specific seasons or events?”</td>
<td>“What medications are you taking?”</td>
</tr>
<tr>
<td><em>(Recent assessment)</em> “In the past 2 weeks, how many days have you:”</td>
<td>“How do you feel about taking medication?”</td>
</tr>
<tr>
<td>■ Had problems with coughing, wheezing, shortness of breath, or chest tightness during the day?”</td>
<td>“How often do you take each medication?”</td>
</tr>
<tr>
<td>■ Awakened at night from sleep because of coughing or other asthma symptoms?”</td>
<td>“How much do you take each time?”</td>
</tr>
<tr>
<td>■ Awakened in the morning with asthma symptoms that did not improve within 15 minutes of inhaling a short-acting beta-agonist?”</td>
<td>“Have you missed or stopped taking any regular doses of your medications for any reason?”</td>
</tr>
<tr>
<td>■ Had symptoms while exercising or playing?”</td>
<td>“Have you had trouble filling your prescriptions (e.g., for financial reasons, not on formulary)?”</td>
</tr>
<tr>
<td>■ Been unable to perform a usual activity, including exercise, because of asthma?”</td>
<td>“How many puffs of your inhaled short-acting beta-agonist (quick-relief medicine) do you use per day?”</td>
</tr>
<tr>
<td><strong>Monitoring Pulmonary Function</strong></td>
<td>“How many [name inhaled short-acting beta-agonist] inhalers [or pumps] have you been through in the past month?”</td>
</tr>
<tr>
<td><strong>Lung Function</strong></td>
<td>“Have you tried any other medicines or remedies?”</td>
</tr>
<tr>
<td>“What is the highest and lowest your peak flow has been since your last visit?”</td>
<td><strong>Side Effects</strong></td>
</tr>
<tr>
<td>“Has your peak flow dropped below ___ L/min (80 percent of personal best) since your last visit?”</td>
<td>“Has your asthma medicine caused you any problems?”</td>
</tr>
<tr>
<td>“What did you do when this occurred?”</td>
<td>■ Shakiness, nervousness, bad taste, sore throat, cough, upset stomach, hoarseness, skin changes (e.g., bruising)</td>
</tr>
<tr>
<td><strong>Peak Flow Monitoring Technique</strong></td>
<td><strong>Inhaler Technique</strong></td>
</tr>
<tr>
<td>“Please show me how you measure your peak flow.”</td>
<td>“Please show me how you use your inhaler.”</td>
</tr>
<tr>
<td>“When do you usually measure your peak flow?”</td>
<td><strong>Monitoring Patient–Provider Communication and Patient Satisfaction</strong></td>
</tr>
<tr>
<td><strong>Monitoring Quality of Life/Functional Status</strong></td>
<td>“What questions have you had about your asthma daily self-management plan and action plan?”</td>
</tr>
<tr>
<td>“Since your last visit, how many days has your asthma caused you to:”</td>
<td>“What problems have you had following your daily self-management plan? Your action plan?”</td>
</tr>
<tr>
<td>■ Miss work or school?”</td>
<td>“How do you feel about making your own decisions about therapy?”</td>
</tr>
<tr>
<td>■ Reduce your activities?”</td>
<td>“Has anything prevented you from getting the treatment you need for your asthma from me or anyone else?”</td>
</tr>
<tr>
<td>■ (For caregivers) Change your activity because of your child’s asthma?”</td>
<td>“Have the costs of your asthma treatment interfered with your ability to get asthma care?”</td>
</tr>
<tr>
<td>“Since your last visit, have you had any unscheduled or emergency department visits or hospital stays?”</td>
<td>“How satisfied are you with your asthma care?”</td>
</tr>
<tr>
<td><strong>Monitoring Exacerbation History</strong></td>
<td>“How can we improve your asthma care?”</td>
</tr>
<tr>
<td>“Since your last visit, have you had any episodes/times when your asthma symptoms were a lot worse than usual?”</td>
<td>“Let’s review some important information:”</td>
</tr>
<tr>
<td>If yes, “What do you think caused the symptoms to get worse?”</td>
<td>■ When should you increase your medications? Which medication(s)?”</td>
</tr>
<tr>
<td>If yes, “What did you do to control the symptoms?”</td>
<td>■ When should you call me [your doctor or nurse practitioner]? Do you know the after-hours phone number?”</td>
</tr>
<tr>
<td>“Have there been any changes in your home or work environment (e.g., new smokers or pets)”</td>
<td>■ If you can’t reach me, what emergency department would you go to?”</td>
</tr>
</tbody>
</table>

*These questions are examples and do not represent a standardized assessment instrument. The validity and reliability of these questions have not been assessed.

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 mediation. 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 2–8 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 sailing 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)

Retrieved from Expert Panel Report 3 (EPR 3): Guidelines for the Diagnosis and Management of Asthma
**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 ≤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

**FEV₁ or PEF ≤40% (Severe)**
- Oxygen to achieve SaO₂ ≥90%
- Nebulized SABA and ipratropium
- Intravenous corticosteroids
- Consider adjunct therapies

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

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

**Repeat Assessment**
- Symptoms, physical examination, PEF, O₂ saturation, other tests as needed

**Moderate Exacerbation**
- FEV₁ or PEF 40–60% predicted/personal best
- Physical exam: moderate symptoms
- Inhaled SABA every 60 minutes
- Oral systemic corticosteroid
- Continue treatment 1–3 hours, provided there is improvement; make admit decision in <4 hours

**Severe Exacerbation**
- FEV₁ or PEF <40% predicted/personal best
- Physical exam: severe symptoms at rest, accessory muscle use, chest retraction
- History: high-risk patient
- No improvement after initial treatment
- Oxygen
- Nebulized SABA + ipratropium, hourly or continuous
- Oral systemic corticosteroids
- Consider adjunct therapies

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

**Good Response**
- FEV₁ or PEF >70%
- Response sustained 60 minutes after last treatment
- No dismiss
- Physical exam: normal

**Incomplete Response**
- FEV₁ or PEF 40–60%
- Mid-to-moderate symptoms

**Poorest Response**
- FEV₁ or PEF <40%
- PCO₂ ≥42 mm Hg
- Physical exam: symptoms severe, drowsiness, confusion

**Individualized decision re: hospitalization (see text)**

**Discharge Home**
- Continue treatment with inhaled SABA.
- Continue course of oral systemic corticosteroid.
- Consider initiation of an ICS.
- Patient education
  - Review medications, including inhaler technique.
  - Review/reinitiate action plan.
  - Recommend close medical followup.

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

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

**Improve**

Key: FEV₁, forced expiratory volume in 1 second; ICS, inhaled corticosteroid; MDI, metered dose inhaler; PCO₂, partial pressure carbon dioxide; PEF, peak expiratory flow; SABA, short-acting β₂-agonist; SaO₂, oxygen saturation.
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Dose/Timing</th>
<th>Education/Advice</th>
<th>M.D./R.N. Initials</th>
</tr>
</thead>
</table>
| Inhaled medications (e.g., MDI with valved holding chamber [VHC or spacer]; nebulizer) | Select agent dose, and frequency (e.g., albuterol) | - Teach purpose  
- Teach and check technique  
- For MDIs, emphasize the importance of VHC or spacer | |
| SABA | 2–6 puffs every 3–4 hours as needed | | |
| Corticosteroids | Medium dose | | |
| Oral medications | Select agent dose, and frequency (e.g., prednisone 50 mg qd for 5 days) | - Teach purpose  
- Teach side effects | |
| Peak flow meter | For selected patients: measure a.m. and p.m. PEF, and record best of three tries each time | - Teach purpose  
- Teach technique  
- Distribute peak flow diary | |
| Followup visit | Make appointment for followup care with primary clinician or asthma specialist | Advise patient (or caregiver) of date, time, and location of appointment, ideally within 7 days of hospital discharge | |
| Action plan | Before or at discharge | Instruct patient (or caregiver) on simple plan for actions to be taken when symptoms, signs, or PEF values suggest airflow obstruction | |

Key: MDI, metered-dose inhaler; PEF, peak expiratory flow; SABA, short-acting beta-agonist.