How to Recognize and Treat Severe Asthma in the Emergency Department
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Introduction

Asthma is a common disease in developed countries and accounts for a large number of visits to the emergency department (ED). Most cases are mild in intensity and are easily managed with beta-agonists, steroids, and observation before discharge. Unfortunately, the frequency of these relatively benign presentations sometimes causes acute-care providers to lower their guard and treat severe cases of asthma in a nonaggressive manner -- until it is too late.

In addition, many of the therapies that have been proposed in past years for moderate-to-severe exacerbations are poorly studied or ineffective. Use of these therapies does nothing more than delay proper care. The following article provides an evidence-based update of the various options for emergent treatment of acute asthma.

Emergency Treatment of Asthma

Lazarus SC

Summary

Historical factors that have been correlated with an increased risk for death from asthma include previous intubation or intensive care unit (ICU) admission, 2 or more hospitalizations for asthma during the past year, low socioeconomic status, and coexisting illnesses.

Physical examination factors associated with an increased risk for death include altered mental status, paradoxical chest or abdominal movement, or absence of wheezing.

Laboratory and imaging studies can be performed selectively on the basis of concerns brought up in the history and examination. The only test that should probably be performed routinely is measuring the forced expiratory volume in 1 second (FEV$_1$) or peak expiratory flow (PEF).

The initial treatment for an asthmatic patient who presents to the ED may include beta$_2$-adrenergic agonists, anticholinergic agents, systemic corticosteroids, and other treatments (Table).

Table. Recommended First-Line Treatments for Asthma: Patients Who Present to the Emergency Department

<table>
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<tr>
<th>Beta$_2$-Adrenergic Agonists</th>
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<td>• Inhaled short-acting beta$_2$-adrenergic agonists are the mainstay of initial therapy. They can be repeated every 20 minutes or be given continuously in sicker patients.</td>
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<td>• The use of metered-dose inhalers is as effective as a nebulizer but is more difficult to administer in sicker patients, so they are best reserved for patients with mild exacerbations. The dose for exacerbations is greater than that used for routine outpatient symptoms: 4 to 8 puffs every 20 minutes for up to 4 hours, then every 1 to 4 hours as needed.</td>
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<td>• Continuous nebulization (vs intermittent nebulizer use) in severe asthma seems</td>
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to result in greater improvements in PEF and FEV$_1$ and a greater reduction in hospitalization, according to a recent Cochrane review.\textsuperscript{1}

- Levalbuterol, the $R$-enantiomer of albuterol, is no better than regular albuterol for ED treatment of acute asthma.
- Oral and parenteral administration of beta$_2$-adrenergic agonists are associated with more adverse effects but without clinical benefits and therefore are not recommended in clinical practice.

**Anticholinergic Agents**

- Inhaled ipratropium can be given in combination with beta$_2$-adrenergic agonists in patients with severe asthma exacerbations. These agents have been shown to decrease hospitalization rates by 25%.

**Systemic Corticosteroids**

- Systemic corticosteroids are indicated in most patients with exacerbations who present to the ED, although they can probably be withheld in patients who have a rapid response to initial therapy with beta$_2$-adrenergic agonists. Outcomes did not seem to differ between oral vs parenteral dosing, although patients in extremis or altered mental status should be given intravenous dosing.
- Although optimal dosages are not known, daily dosages greater than 100 mg of prednisone equivalent did not seem to have an advantage.
- High-dose inhaled corticosteroids are useful for long-term control of asthma, although the evidence does not support their use in acute exacerbations.

**Other Treatments**

- Methylxanthines are associated with increased adverse events without improvements in outcomes.
- Antibiotics should not be used routinely; they should be reserved for patients in whom a bacterial infection is very likely.
- Intravenous magnesium is controversial. In adults with severe exacerbations, there seems to be a mild improvement in lung function but no effect on hospital admissions. However, in children with severe exacerbations, admission rates associated with use of intravenous magnesium are slightly reduced.
- Heliox (mixture of helium and oxygen) is controversial as well. Although early studies were promising, more recent studies have demonstrated no significant benefit when used routinely. A Cochrane review concluded that heliox might be beneficial in patients with severe airflow obstruction whose initial response to therapy failed.\textsuperscript{2}


The decision to admit or discharge a patient with asthma should be made within 4 hours of presentation to the ED, based on reassessment of the patient after the first and third treatments. The reevaluations should include work of breathing and measurement of FEV$_1$ or PEF. The patient reevaluation after the third
treatment is highly predictive of the need for admission and ICU care. Patients who have persistent moderate-to-severe symptoms, drowsiness, confusion, or FEV$_1$ less than 40% predicted should be admitted.

Patients with altered mental status (a sign of hypoxia or hypercapnia), exhaustion (often manifest as worsening diaphoresis, tachycardia, or retractions), or worsening hypercapnia (on arterial blood gas or end-tidal CO$_2$ monitoring) should be strongly considered for intubation and mechanical ventilation. Permissive hypercapnia is acceptable.

Evidence for the use of noninvasive positive pressure ventilation is limited, but small studies using bilevel positive airway pressure (BiPAP) have been promising. A brief trial of BiPAP in severe exacerbations may be attempted. If the patient does not tolerate the mask, has altered mental status, or continues to decompensate, BiPAP should be discontinued in favor of intubation.

Patients may be discharged if the FEV$_1$ or PEF after treatment is 70% or greater of the personal best or predicted value and if the improvements are clinically sustained for at least 60 minutes. Patients should be counseled to continue using their inhaled short-acting beta$_2$-adrenergic agonists as needed and should be given a 3- to 10-day course of oral corticosteroids at discharge. In addition, they should be educated regarding avoidance of any possible triggers. Close follow-up with their primary care physician should be emphasized.

**Viewpoint**

The article provides a nice review of the ED treatment of asthma. Although providing no groundbreaking new information, it does validate current ED practices and also clarifies some areas of confusion, especially regarding the utility of magnesium, heliox, and BiPAP. Although the article was written by an intensive care physician, it falls a bit short in its recommendations regarding care of the patient receiving mechanical ventilation -- something very relevant to ED practice. Best practice in this setting clearly dictates supporting preload through aggressive use of intravenous fluids, avoidance of barotrauma by maintaining low plateau pressures and tidal volumes, and using low ventilatory rates to avoid breath-stacking. Furthermore, permissive hypercapnia is acceptable, but severe acidosis should be avoided (eg, maintain pH > 7.20 as a guideline).

It should also be emphasized that intubation of the crashing asthmatic patient is no time for the intern to learn intubation! These patients have minimal oxygen reserve, so the intubation should be performed quickly by an experienced provider.

Finally, in regard to discharge, perhaps every patient should be observed doing a few laps through the ED hallways before leaving. Only if they look well after such a "road test" should they be allowed to go home.