

CASE 4.1
Asthma | Level 1

Manar O. Lashkar and Hanna Phan

1. What subjective and objective evidence exists in the patient to support a diagnosis of severe asthma exacerbation?

SUBJECTIVE FINDINGS: The patient presented with inability to breathe and poor response to albuterol inhaler. This past week, he has been requiring his albuterol use nightly, which is more frequent than usual. He has an increased requirement of albuterol in the last month, requiring two refills. He has a history of missed school days due to shortness of breath, inability to exercise, and continued coughing at night.

OBJECTIVE FINDINGS: On physical exam, SpO₂ 85% on RA (<90%), RR 42 breaths per min (>40), PEF is 35% (<40% of personal best), increased anterior-posterior diameter of the chest on lung exam, and hyperinflation with nasal flaring. The patient has inspiratory and expiratory wheezing, dyspnea, and is unable to speak full sentences.

2. List risk factors that necessitate intensive care unit admission in a patient with asthma exacerbation. Is this patient considered high risk with regard to his asthma?

Patients with asthma are considered high risk for a severe asthma exacerbation, when they have (1) previous severe exacerbation (e.g., ICU admission); (2) two or more hospitalizations or more than three ED visits in the past year; (3) use of greater than two canisters of albuterol in a month; (4) difficulty perceiving airway obstruction or the severity of asthma worsening; (5) low socioeconomic status or inner-city residence; (6) illicit drug use; (7) major psychosocial problems or psychiatric disease; or (8) comorbidities such as cardiovascular disease or other lung disease. High-risk asthma patients require additional care components including intensive asthma education, monitoring, and monthly follow-up.

This patient would be considered high risk for a severe asthma exacerbation given the following factors specific to his case: (1) previous severe exacerbation (i.e., previous ICU admission); (2) two hospitalizations in the last year; (3) difficulty perceiving airway obstruction or the severity of asthma worsening (the patient has always had breathing problems and did not follow up with his pediatrician); and (4) major psychosocial problems or psychiatric disease given his diagnosis of ADHD.

3. Determine the classification of asthma control for the patient. Which components of control did the patient present with to support this classification?

The patient presented with cough throughout the day with nighttime awakenings more than twice a week. His asthma is interfering with his normal activity to the point where routine activities like gym class or even attending school is a challenge. He requires the use of his rescue inhaler several times a day and throughout the night. His lung function is 35% (less than 60% of personal best using PEF). Given this level of impairment of normal activity and need for rescue therapy, his asthma is currently considered “very poorly controlled” and will require step up (1 to 2 steps) of his chronic asthma regimen once his acute exacerbation is effectively treated. He should be re-evaluated in clinic 2 weeks after discharge and followed up regularly (e.g., every 4 weeks) until his asthma is under better control.

4. Assess the patient’s current acute pharmacologic therapy for asthma.

The goals of therapy in a patient with acute asthma exacerbation are to establish control of the asthma (i.e., reduce symptoms, maintain oxygenation, eat and drink without difficulty, and prevent adverse drug reactions). The patient presented with a severe asthma exacerbation, based on subjective and objective findings. The patient was started on a systemic corticosteroid in the ED, but the dose was likely not absorbed due to emesis soon after oral dose of prednisolone. The patient will need to be started on intravenous corticosteroid until he can tolerate oral intake. The recommended corticosteroid dose is methylprednisolone at 2 mg/kg/day divided q 12 hr (methylprednisolone 30 mg IV q 12 hr). Systemic steroid dose may be reduced to 1 mg/kg/day and changed to oral route (e.g., prednisone 30 mg tablet po daily) once patient is on less frequent albuterol nebulization (e.g., q 2 hr dosing) and able to tolerate oral intake as a result of improved respiratory symptoms (reduced tachypnea and dyspnea). Current use of continuous albuterol is appropriate and patient’s response to therapy should be monitored (e.g., reduced shortness of

breath and wheezing) as well as adverse reactions such as tachycardia and hypokalemia. Albuterol dose and frequency may be reduced as patient’s symptoms improve (respiratory rate, oxygen saturation, accessory muscle use, air exchange, wheezing, and inspiratory to expiratory ratio). These parameters should be monitored every 2 hours initially until the albuterol frequency is reduced to every 2 hours. When this is achieved, monitoring would continue to be every 2 hours until the frequency of albuterol can be decreased to every 4 hours. After that, the patient can be monitored every 4 hours, and if his symptoms are stable and did not require any other intervention, he can be discharged.

5. Identify a potential medication-related adverse reaction associated with asthma exacerbation therapy and its management.

The patient is hypokalemic (potassium of 3 mmol/L) secondary to continuous albuterol infusion. Beta-2 agonists can shift potassium into the cells leading to hypokalemia. The addition of potassium chloride to IV fluids (D5W-½NS with 20 mEq KCL per liter) is recommended. This effect will be diminished as albuterol frequency is decreased and patient starts on oral diet.

6. Devise a discharge pharmacologic regimen for his asthma and other conditions.

The desired outcomes for this patient include reduction of both impairment and risk. Reduction of impairment includes a decrease in the use of his rescue inhaler to less than two times per week, limited interference in normal activity, nighttime symptoms less than two times per month, and lung function as measured by greater than 80% of his personal best PEF. Reduction in risk includes decrease in exacerbations requiring oral corticosteroids to less than once a year as well as prevention of treatment-related adverse reactions.

Given this acute exacerbation resulted in admission to the PICU, increasing chronic therapy by 2 steps may be warranted. Based on the patient’s age and current chronic asthma regimen, he is on step 2 asthma therapy with low-dose inhaled corticosteroid (fluticasone