

# How to diagnose and treat acute asthma

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### CASE

A 25-year-old female with history of asthma presents to the emergency department (ED) with 3 days of worsening cough, dyspnea, and wheezing after several days of upper respiratory track symptoms. On examination, there is diffuse, bilateral, musical wheezing, decreased air entry, expiratory prolongation, some supraclavicular in-drawing, and a respiratory rate of 24 breaths/min. She is afebrile, SaO<sub>2</sub> = 93% on room air, and her pulse is 104 beats/min. She has used her salbutamol puffer 12 times in the past 24 hours. She is a cigarette smoker (0.5 pack/day for 5 years), is attending a local university, and has housed a pet cat for 5 years.

### KEY CLINICAL QUESTIONS

- 1. Which patients with dyspnea likely have acute asthma?**  
**Answer: Non-smoking young patients who wheeze, with a history of asthma/allergies.**

A combination of history and physical examination, serial pulmonary function measures (usually peak expiratory flow [PEF]), and an assessment of response to therapy will confirm the diagnosis of acute asthma and eliminate other possible causes of dyspnea. Asthma usually starts in childhood, is associated with other allergic conditions (e.g., eczema, allergies), and not associated with smoking. It is important to obtain an employment history in what appears to be adult-onset asthma, because jobs (e.g., painting, baking, industrial activities) associated with airway irritants can cause occupational asthma. The role of exposure to air pollution (e.g., wildfire smoke, industrial pollutants) should also be explored.

- 2. Which alternative diagnoses could mimic acute asthma?**  
**Answer: Bronchitis (young) and chronic obstructive pulmonary disease (COPD; older with a smoking history) are the common mimics.**

In young adults, acute viral bronchitis is a common mimic. Older patients who smoke and present with wheezing may be misdiagnosed with asthma; however, they more commonly have COPD. Features to help clinicians differentiate between asthma and COPD are shown in [Table 1](#).<sup>1</sup> Tuberculosis may be a mimic in travellers from international locations and indigenous Canadians.

- 3. Which patients need further investigations?**  
**Answer: Very few patients with asthma need laboratory and/or imaging tests.**

Most patients with acute asthma have single-system presentations, and laboratory tests are not needed (especially not arterial blood gases). While other endocrine/autoimmune disorders (e.g., diabetes mellitus, thyroid disease) can

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**Table 1. Common features that differentiate asthma from chronic obstructive pulmonary disease (COPD)\***

Factor	Asthma	COPD
Age	Usually starts in early life	Later onset
Sex	Boys > girls; Women > men	Men > women ... but catching up!
Family history	Frequent	Non-contributory
Allergic conditions	Frequent	Uncommon
Cigarette exposure	Non-contributory	Causative
Comorbidities	Uncommon	Frequent
Course	Exacerbations with recovery	Exacerbations with permanent lung damage
FEV <sub>1</sub> or PEF	Variable obstruction	Fixed obstruction
Response to SABA	Measureable	Blunted/absent
FEV <sub>1</sub> /FVC ratio	>0.7	≤0.7

COPD = chronic obstructive pulmonary disease; FEV<sub>1</sub> = forced expiratory volume in 1 second; FVC = forced vital capacity; PEF = peak expiratory flow; SABA = short-acting beta-agonist.  
 \*Adapted from O'Donnell DE, Aaron S, Bourbeau J, et al. CRJ Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease – 2007 update. *Can Respir J* 2007;14(Suppl B):5B-32B.

coexist in patients with asthma, exacerbations are usually unrelated to other chronic conditions. In addition, few people have pulmonary complications, so chest radiographs should not be ordered routinely. Despite this, ED-based studies have demonstrated frequent chest radiograph ordering for acute asthma (~39% in Alberta), which delays treatment and dispositions, exposes patients to needless radiation, and adds unnecessary costs to care. Chest radiographs *should* be considered when patients exhibit signs of pneumonia (e.g., fever, thick sputum, chest pain), pneumo-mediastinum/thorax (e.g., severe chest pain, subcutaneous emphysema), do not respond to standard care or prior to admission. International guidelines encourage treating asthma symptoms and monitoring response to treatment prior to further investigations.<sup>2</sup>

**4. For acute asthma, are there any new treatments that emergency physicians should consider beyond the “usual”?**

**Answer: Consider intravenous (IV) MgSO<sub>4</sub> and inhaled corticosteroids (ICS) in severe asthma.**

With the exception of patients with mild asthma, most patients should receive systemic corticosteroids (SCS) and frequent short-acting beta-agonist (SABA; salbutamol) in the ED (Appendix).<sup>2</sup> Oral and IV SCS agents appear equivalent, so IV agents should be reserved for patients who are vomiting, have severe dyspnea, and those who cannot absorb oral agents. Delivery of SABA through metered-dose inhalers (MDI) with spacer devices has replaced nebulization in all but the most severe cases of acute asthma in Canada.<sup>3</sup> In moderate-severe acute asthma, evidence supports the addition of inhaled short-acting anticholinergics (SAAC; ipratropium bromide). In addition to SABA +/- SAAC and SCS agents, in severe cases, the following agents should be considered: IV magnesium sulfate (2 g), ICS (high dose), and intramuscular epinephrine. While the evidence is limited, non-invasive ventilation may prevent intubation in severe cases.

**5. If the patient responds to ED management, what strategies should be used at discharge?**

**Answer: All patients should receive short-course systemic and ICS after discharge; medication and lifestyle adherence is also vital.**

Most patients (90%–95%) with acute asthma in Canada do not require hospitalization unless they have severe asthma and/or experience a complication. Patients who achieve persistent symptom relief and/or improvements in PEF are generally safe for discharge. Overall, guidelines strongly support the use of short courses (5–7 days) of SCS (e.g.,

prednisone); shorter courses have yet to be proven effective in adults.<sup>2,4</sup> Patients receiving ICS as monotherapy or combined with long-acting beta-agonists (LABA) should be encouraged to continue, and, if not using regularly, engaging in discussions with patients to explain the importance of regular use is vital. Those not receiving ICS prior to the ED visit should be prescribed these agents for at least 4–6 weeks in addition to SCS.<sup>2</sup> Consider escalation of inhaler therapy (e.g., ICS switched to ICS/LABA) if patients exacerbate while fully adhering to medications.<sup>5</sup>

**6. When should patients be reassessed, and what other strategies could help them avoid a relapse?**  
**Answer: Follow up with a usual care provider within a week of ED discharge.**

Relapse occurs in approximately 18% at 14 days in Canada.<sup>5</sup> Patients should be reassessed for symptom persistence and response to therapy within a week of ED discharge by their primary care provider (PCP), a discussion of triggers, and lifestyle changes that would support better asthma control should be undertaken. Asthma education, symptom-based or PEF monitoring, and written asthma action plans have relevance for preventing future exacerbations.

### **CASE RESOLUTION**

This patient received 50 mg of oral prednisone and combination inhaled bronchodilators (SABA/SAAC) via MDI/spacer over 2 hours in the ED. Her PEF increased from 200 (45%) to 350 (78%) L/min during that period, and her air entry was equal bilaterally. No laboratory tests or radiographs were ordered. She was discharged on a 5-day, non-tapering course of oral prednisone and an ICS. She was advised to follow up with her PCP within 7 days and to consider smoking cessation strategies.

#### **KEY POINTS**

- Asthma is a complex, chronic respiratory condition, and a presentation to an ED with an exacerbation is an important demonstration of loss of control and an opportunity to intervene.
- Most patients with acute asthma can be treated symptomatically and discharged from the ED after appropriate care without extensive investigations.
- Attention to evidence-based care recommendations after discharge will improve outcomes for patients with acute asthma.
- Pharmaceutical (e.g., evidence-based care and adherence) and non-pharmaceutical (e.g., smoking cessation, asthma education, trigger avoidance, and proper diet and sleep) management are both important in preventing relapses.

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