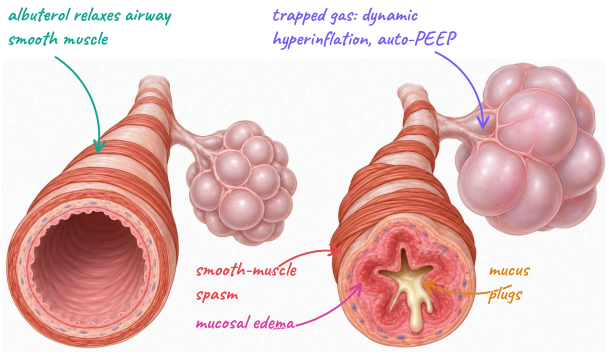
ER BASICS · ONE-PAGER

Asthma and COPD Exacerbations

Severity signs, first treatments, oxygen targets, NIV and ventilating obstructive lungs

12 sources + more detail
erbasics.com/sheets/asthma-copd.html
checked Nov 2026

ANATOMY Why the airways narrow



1 Severe asthma

SEVERE	LIFE-THREATENING
Talks in words, sits hunched forward	Drowsy, confused, silent chest
RR over 30, HR over 120	Bradycardia, hypotension, poor effort
SpO_2 under 90%, peak flow 50% or less	Normal or rising $PaCO_2$: the patient is tiring

- Albuterol, repeated or continuous, plus ipratropium
- Oxygen to SpO_2 93–95% in adults
- Systemic steroids early (prednisone 40–50 mg or IV equivalent)
- IV magnesium 2 g over 20 min for severe attacks
- Not helped: routine antibiotics, sedatives, theophylline

EXAM TIP A 'normal' $PaCO_2$ of 40 in a wheezing, tachypneic patient is ominous: expect it to be low. Prepare for intubation.

2 COPD exacerbation

- Short-acting bronchodilators (albuterol with or without ipratropium)
- Prednisone 40 mg for 5 days
- Antibiotics if sputum is more purulent plus more dyspnea or volume, or if ventilated
- Oxygen to SpO_2 88–92%: higher targets raise $PaCO_2$
- Bilevel NIV for pH 7.35 or less with $PaCO_2$ over 45; cuts intubation and death

SAFETY High-flow oxygen in CO_2 retainers worsens hypercapnia (V/Q mismatch and the Haldane effect), not only by blunting drive.

3 Ventilating obstructed lungs

- Goal: time to exhale. Low rate (10–14), Vt 6–8 mL/kg PBW, high inspiratory flow, short inspiratory time
- Accept permissive hypercapnia (pH over about 7.20)
- Check auto-PEEP (end-expiratory hold) and plateau pressure (under 30)
- Ketamine is a useful induction drug in asthma (bronchodilates)

SAFETY Sudden hypotension after intubation: air trapping or tension pneumothorax. Disconnect from the ventilator briefly to let air out, then reassess.

EXAM TIP High peak with a normal plateau = airway resistance (bronchospasm); treat with bronchodilators, not more pressure.

MORE Obstructive physiology: flow limitation, hyperinflation, V/Q

In asthma, smooth-muscle spasm, mucosal edema and mucus plugs narrow the airways, and most of the narrowing reverses with treatment. In COPD, emphysema destroys the elastic recoil that holds small airways open, so they collapse during exhalation (expiratory flow limitation) and extra effort no longer speeds emptying. Either way the expiratory time constant (resistance × compliance) lengthens, and the next breath starts before the lung has emptied.

The trapped gas raises end-expiratory lung volume (dynamic hyperinflation) and leaves alveolar pressure positive at end-expiration (auto-PEEP). The flattened diaphragm works at a mechanical disadvantage, and auto-PEEP is a threshold load: the patient must lower alveolar pressure by that amount before air flows in, seen as efforts that fail to trigger the ventilator. High intrathoracic pressure also cuts venous return, so positive pressure, sedation or fast bagging can drop the blood pressure abruptly, and overdistended alveoli can rupture.

Hypoxemia comes from low V/Q units, not shunt, and usually corrects with modest oxygen; in asthma, a PaO_2 under 55 mm Hg or a need for FiO_2 above 0.3–0.5 should prompt a search for pneumonia, atelectasis or pneumothorax (Corbridge and Hall 1995). Early in an asthma attack $PaCO_2$ is low; hypercapnia usually means FEV_1 below about 25% of predicted or a tiring patient (McFadden 1968). In COPD, $PaCO_2$ rises when resistance, hyperinflation and dead space outrun weak respiratory muscles.

EXAM TIP Peak pressure reflects airway resistance and inspiratory flow; plateau and auto-PEEP reflect hyperinflation, which is what causes hypotension and barotrauma (Tuxen 1987).

MORE Intubating severe asthma

Intubate for arrest, falling consciousness, exhaustion or worsening acidosis despite full treatment; no single $PaCO_2$ decides it. In Williams 1992, hypotension (20%), barotrauma (14%) and arrhythmias (10%) among ICU asthma admissions occurred only in ventilated patients. These are physiologically difficult airways: hypoxemic, hyperinflated, often dehydrated, and held up by catecholamines that vanish at induction.

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