



Objectives: identify similarities and differences in asthma and COPD presentations as well as their causes, relevant history and physical exam findings, diagnosis and complications, treatment, and disposition.

Asthma: *reversible* bronchoconstriction of the upper airways. Type 1 hypersensitivity response with immediate and late ("delayed") phase.

Common precipitants: environmental (most common cause- worsened by poor compliance and includes cold temperature, pollution, airborne allergens, exercise); infection less common.

Presentation: acute dyspnea over hours to days with wheezing and/or poor air movement on exam.

Assessment: ABC's as always. Are they protecting their airway? How alert are they? Are they in respiratory distress or able to speak in clear, complete sentences? Are they using accessory muscles to breathe? What is heard on their lung exam? Relevant history: ever intubated? How many exacerbations and hospitalizations per year? ICU admission?

From these questions you must decide what type of asthmatic you are dealing with and from here on out we detail these separately in either column: stable vs unstable.

Stable Asthmatic

Diagnosis: if presentation consistent with asthma exacerbation, **diagnosis is clinical** and no further tests are needed. *Peak flow testing has not been found to be reliable and therefore is not indicated!
-Chest x-ray and lab work is not indicated routinely if the diagnosis is straightforward. If a patient has other comorbidities or a cloudy presentation, consider getting them.

First line treatment (do immediately): *Think common sense here- these patients have obstructive lung disease. What can we do for them? *O₂ and reverse the bronchoconstriction!*

- **Oxygen:** high dose therapy. Escalate as needed: Nasal cannula → Face mask → NRB
- **Bronchodilators:** the most important thing you can give!
Albuterol/Ipratropium nebulizer
- **IV or PO steroids:** delayed effect within hours but reduces relapses and readmissions. IV is typically methylprednisolone (Solumedrol, Medrol), PO is prednisone or dexamethasone.

If failure to improve consider other causes or patient might be worsening and need further evaluation and management (see right column).

Disposition: discharge for most, admission for few. Send home on ~5 day course of prednisone burst (40-60 mg daily). It is cheap and drastically reduces relapse of exacerbation. No need for a taper! Research has shown these are pointless for <5 day therapy.

Always the wrong answer on tests and in real life: theophylline, Heliox. We do not give these medications in the ED as they are no longer indicated (as for Theo.), or they are often controversial with limited data (Heliox).

-Leukotriene modifiers/antagonists, LABAs, and Omalizumab should never be given.

Bonus time: NIPPV → BiPAP and CPAP

NIPPV is a form of noninvasive respiratory support delivered via face mask that has a tight seal. Oxygen, inhaled medications, and other gases can be given with higher airway pressures. NIPPV helps "stent" airways open and allow for better oxygenation, ventilation, and relief from obstructive lung disease.

-BiPAP: 2 pressure settings, inspiratory (IPAP) and expiratory (EPAP). Bigger the IPAP = bigger the "push" of air coming in. EPAP is essentially PEEP.

-CPAP: same thing as PEEP → positive end expiratory pressure. This mode keeps a steady stream of pressurized air in the airways throughout the respiratory cycle, allowing for alveoli to remain open and be recruited.

Unstable Asthmatic

Diagnosis: still clinical but these patients are SICK. Either too sick that they aren't talking, or worse, their respiratory rate has declined meaning they are not able to continue hyperventilating (big risk for intubation!). Should get VBG, CXR, laboratory work including CBC, BMP. Won't help you immediately, but need to rule out other issues and they will be admitted regardless.

First line treatment (do immediately):

- **Oxygen:** high flow. Escalate as needed: Nasal cannula → Face mask → NRB → NIPPV
- **Bronchodilators:** the most important thing you can give!
Albuterol/Ipratropium nebulizer. Continue to re-dose these. If no effect do continuous nebs.
- **IV steroids**

2nd line: If the above are failing to improve the patient, consider these.

- **IV Magnesium:** 50mg/kg bolus. Can cause some hypotension. Has been shown to help some sicker patients via bronchodilation.
- **IM Epinephrine** 0.3mg, 1:1000 (anaphylaxis dose). Potent beta agonist stimulation of bronchodilation. You can also do **IV Epinephrine** (10 mcg/ml) as a push dose if hypotensive (IM might not be circulating well).
- **IV ketamine:** 0.1 mg/kg bolus can be given for bronchodilation as well as dissociative amnesia as you prepare for optimal NIPPV. Also does not depress cardiopulmonary drive if delayed sequence intubation is selected. Remember though, it does cause increased bronchial secretions so have that suction ready if you do (God forbid) have to intubate.

If failure to improve on the above and BiPAP, consider intubation (more on that below).

Disposition: Admission for all, ICU for most

NIPPV Indications:

Asthma,
Pneumonia, COPD,
OSA,
Neuromuscular DO,
CHF exacerbation

Contraindications:

-Impaired consciousness
-cannot clear secretions/
protect airway
-aspiration risk (emesis)

Last resort: Intubation

- Endotracheal intubation does NOT help fix the underlying problem in asthma and COPD. It should only be used if the patient can no longer tolerate the work of breathing and ventilation/airway protection are the concern.
- Delayed sequence intubation:
- Once intubated → continue efforts to maximize airway obstruction (Albuterol through ETT, Mag, steroids, etc.)
- Vent settings: “**permissive hypercapnia**”. We want to avoid barotrauma which includes pneumothorax, so we do the following... low tidal volumes, low minute ventilation (6-8 breaths/min), <5 PEEP, Oxygen >88% is fine, and pH does not need full normalization. I:E ratio 1:4.
- In a critical scenario when the patient appears to be arresting or the ventilator states there is high peak pressure, disconnect the vent and compressing the chest to release trapped air. Also, these patients should be heavily sedated and consider short term paralysis so that the patient does not interfere with the ventilator.

COPD

Overview: COPD is just a name. It is divided into emphysema and chronic bronchitis, but for ED purposes these patients receive the same therapy. The good news is the algorithm for COPD workup is *almost* the same as asthma, except for 2 critical differences: 1) COPD is a *destructive* pathology of the lung, 2) COPD patients are generally older, have more medical problems, and therefore need a more established workup.

Assessment: same as asthma patients (see above!). In addition, Gold Criteria is used for COPD patients.

Gold Criteria for COPD exacerbation: increased cough, increased sputum production/change in color, increased dyspnea

Causes: unlike asthma, the most common cause of COPD exacerbation is **infection** (70%). Greatest predictor of COPD exacerbations is **prior exacerbations** (duh). >2 exacerbations/year or >1 hospitalization/year = high risk COPD patient!

Stable COPD patient**Unstable COPD patient**

Diagnosis: clinical but everyone needs EKG, CXR, laboratory work, CBC, BMP. Attempt to look for other causes of exacerbation (BNP, urine studies, troponins, blood cultures).

First line treatment (do immediately):

- **Oxygen:** start low and escalate as needed: Nasal cannula → Face mask → NRB → NIPPV
- **Bronchodilators:** the most important thing you can give!
Albuterol/Ipratropium nebulizer
- **IV or PO steroids**
- **Antibiotics:** not indicated if patient is being discharged and only has **1/3 Gold Criteria**.

-*uncomplicated* COPD (<65 years old, FEV1 >50, <2 exacerbations/year, no heart disease = **Macrolide, Doxycycline, or TMP/SMX**).

-*complicated* COPD (opposite of above) = **Fluoroquinolone*** or **Augmentin**

If failure to improve consider other causes or patient might be worsening and need further evaluation and management (see right column).

- Differential Diagnoses
 - o **PE** (up to nearly 20% of all COPD exacerbations!)
 - o **CHF**
 - o **ACS**

Disposition: admission for most! Send home on ~5 day course of prednisone.

Diagnosis: EKG, VBG, CXR, laboratory work including CBC, BMP as these patients are sicker and there might be more than meets the eye. BNP if suspected history of CHF. Bedside echo can be performed as well but should not delay management.

First line treatment (do immediately):

- **Oxygen:** Start low and escalate as needed. Aim for 88-92%: Nasal cannula → Face mask → NRB → NIPPV.
- **Bronchodilators:** the most important thing you can give!
Albuterol/Ipratropium nebulizer- re-dose these. If no effect do continuous albuterol.
- **IV steroids**
- **Antibiotics indicated in all moderate/severe patients (2/3 Gold Criteria)**
 - o **Fluoroquinolone*** or **Ceftriaxone if admitted**.

(**Magnesium and Epinephrine have NO ROLE in COPD exacerbation!**)

2nd line: If the above are failing to improve the patient, consider these.

- IV ketamine: Great for NIPPV and, if necessary, intubation.

If failure to improve on the above as well as BiPAP, consider intubation (see above).

Disposition: Admission for all, ICU for most

*Fluoroquinolones should be used with caution or avoided altogether in many older patients (>65) as they have been shown to cause multiple concerning side effects (neuropathy, delirium, QT prolongation, tendinopathy and arthropathy, hepatic toxicity).

Other quick facts from studies (not for the test but good to know!):

MDI equals Nebulizer delivery for efficacy, however nebulizer preferred in acute setting due to patient tolerance and reliable delivery.

PO equals IV steroids for efficacy and time of onset but it's the same story as above. We want to optimize patient breathing and tolerance. No swallowing pills.

Steroids can be considered the most important part of treatment so these need to be given as early as possible if able: multiple studies have shown decreased hospital stay, improved lung function and symptoms, reduced treatment failure risk by 50%, and even reduced relapse risk at 1 month.

Nearly all patients should be discharged home with steroids unless contraindicated or if they were recently given a course and are still on that prior course.

Critically, the 5 day “burst” course of 50-60mg daily prednisone found to be the same as tapered prednisone. Burst preferred due to easier dosing and less complications from patient’s mis-dosing.

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