Inpatient Management of Asthma and COPD

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Goals/Objectives

- Overview
- Initial evaluation
- Treatment algorithm
- Preventing readmissions
Goals/Objectives

- Will review both conditions concurrently with COPD as the default
- Key differences in the treatment of asthmatics will be highlighted (when they exist)
Goals/Objectives

- Treatment recommendations are taken from the pertinent guidelines unless otherwise specified.
- Available at:
  - www.goldcopd.org
  - www.ginasthma.org
Overview

- COPD exacerbations account for roughly half of the ~ 30 billion dollars spent on direct treatment costs of COPD annually
- 1.5 million ED visits
- 715,000 hospitalizations
- COPD has risen to the third leading cause of death in the US

Overview

- Asthma: Annual direct treatment costs are ~ $18 billion
- 1.8 million ED visits but only 440,000 admissions, 3600 deaths
- Children and (especially) African Americans have a higher rate of admission but constitute a smaller portion of the total

2011 CDC data, www.cdc.gov/asthma
Initial evaluation

- For the purposes of this review we will assume that the diagnosis is correct and the patient meets criteria for admission (most are subjective in any event)
- For the sake of time, it is also assumed that much of the up-front care has already been delivered in the ED
Manage Exacerbations: Indications for Hospital Admission

- Marked increase in intensity of symptoms
- Severe underlying COPD
- Onset of new physical signs
- Failure of an exacerbation to respond to initial medical management
- Presence of serious comorbidities
- Frequent exacerbations
- Older age
- Insufficient home support
Initial evaluation

- ADC VAN-whatever
- Admit to: With the understanding that ICU criteria can vary widely between facilities, there are some fairly universal signs that patients will require “higher levels of care”
- Some are obvious like overt respiratory failure or shock (diagnosis)
Warning signs - COPD

- Poor response to initial therapy with continued respiratory distress
- Altered mental status/encephalopathy
- Hypercapnia with an acute respiratory acidosis (uncompensated)
- Serious comorbidities
Warning signs - COPD

- High oxygen requirements
- Great care must be exercised in giving high flow oxygen to COPD patients but not necessarily for the reasons you think
  - V/Q mismatch
  - Mask severity of disease
Warning signs - Asthma

- Relative to COPD, severe asthmatics have a greater risk of sudden decompensation due to the inflammatory nature of the disease.
- All of the warning signs for COPD apply but are often even more serious when seen in an asthmatic.
Warning signs - Asthma

- Hypercapnia can commonly be tolerated in a COPD patient as it is often chronic and well compensated but is very concerning in an asthmatic

- Should similarly be more worried about purse-lipped breathing, “tripoding”, and other signs of increased work of breathing
Warning signs - Asthma

- Can use % of baseline peak flow as an objective measure of response to treatment (or lack thereof)
- PEF still less than 50% of baseline after initial therapy is a definite cause for concern
Warning signs - Asthma

- A patient unable to adequately complete PEF is even more worrisome, as is an inability to speak in near-complete sentences.
Initial evaluation

- ADC VAN-whatever
- Code status: Important discussion to have with severe COPD patients
- Vitals: Most patients will need oximetry, telemetry is debatable in asthmatics or COPD patients with no underlying cardiac disease
Initial evaluation

- **Nutrition**: Obviously NPO if significant respiratory distress
- Malnutrition is common (25-40%) and a known cause of increased morbidity/mortality in COPD
- The evidence supporting the use of nutritional supplements is limited but they may be helpful

*Am J Clin Nutr* (2012)95 no.6 1385-1395
Initial evaluation

- No evidence that disease-specific (e.g., low carbohydrate) supplements or tube feeds are of any additional benefit
Initial evaluation

- **IV fluids**: Dehydration can occasionally be a complication in pediatric asthma patients (esp. the very young) but fluid administration is otherwise not routinely needed.

- **Medications**: Hopefully they received at least one dose each of albuterol and steroids in the ED already.
Inhaled albuterol
Combination with ipratropium has added benefit in mod-severe exacerbations
Nebulizers have no real advantage over MDI’s if the dose is equivalent but may be easier for more dyspneic patients to tolerate
Medications

- No consensus on the choice between continuous or intermittent nebulized therapy
Medications

- Steroids should be given systemically in all patients experiencing a significant enough exacerbation to be pertinent to this talk.
- Inhaled steroids probably have no additive benefit as *initial* therapy.
Steroid doses

- Both sets of guidelines have specific recommendations on the full course of treatment.
- However, cannot make a firm recommendation on the initial dose based on the available data.
Steroid doses

- **COPD**: 40mg PO prednisone daily (or equivalent) for a total of 5 days
- **Asthma**: 1-2mg/kg/day up to a maximum dose of 40mg (pediatrics) or 50mg (adults) for 5-7 days
- No taper needed in either case
- Trials comparing higher doses or duration have not shown a benefit
Antibiotics

- In the absence of another indication, antibiotics are recommended for COPD patients with respiratory failure or who have dyspnea associated with a change in purulence and amount of sputum
Choice of antibiotic is based on local resistance patterns (strep) or patient factors such as colonization with pseudomonas or frequent hospitalizations.

In the majority of patients a macrolide, tetracycline, or amox/clavulanic acid are sufficient.
Antibiotics

- Not recommended for asthma exacerbations unless there is strong evidence of an associated bacterial infection
Other medications

- Magnesium:
  - Very weak data supporting use of IV mag sulfate in COPD
  - May potentiate the effect of albuterol but did not reduce dyspnea scores or need for hospitalization
  - Can have clinically meaningful benefits in more severe asthma exacerbations, particularly in children

Ann Thorac Med. 2014 Apr;9(2):77-80
Other medications

- No role for injected epinephrine in COPD but may be useful in asthma attacks associated with severe allergic reactions, and obviously if there is a concern for anaphylaxis.
- Injected beta agonists are not recommended for routine use in either disease.
Other medications

- The following are not recommended for acute symptoms due to lack of efficacy in either condition:
  - Theophylline
  - Roflumilast
  - Leukotriene antagonists
  - Omalizumab (xolair)
  - Heliox
Medications to avoid

- Mucolytics: Can worsen bronchospasm, esp. in asthmatics
- Sedatives/anxiolytics: Respiratory depression is a concern, especially in the hypercapnic COPD patient
Home medications

- Will go over more in a bit
- Up front, long-acting medications (ICS, LABA, etc) do not add anything meaningful
- Also difficult to administer to the distressed patient
- Don’t forget other comorbidities!
**Labs/Studies**

- ABG, EKG, and CXR are routinely indicated for COPD
- Only in selected asthmatic patients based on severity of disease or known/suspected coexisting conditions
- Sputum cultures if there is a productive cough
Special/Other

- Supplemental oxygen as needed to keep $\text{SaO}_2$ above 90%
- As with any other treatment, be judicious – you can have too much of a good thing
An in-depth discussion of assisted ventilation, particularly invasive mechanical ventilation (IMV) is well outside the scope of this talk.
Ventilation

- Assuming no contraindications are present, non-invasive ventilation (NIV – BiPAP) should be considered the standard of care for hypercapnic respiratory failure due to COPD
Contraindications

- Intolerance or inability to fit the mask
- Facial trauma
- Hemodynamic instability
- Coma/inability to protect airway
- Seizures
- Undrained pneumothorax
- Recent GI surgery or active GI bleed
- Vomiting
- Upper airway obstruction

Curr Opin Crit Care 2013, 19:1–8
**BiPAP - COPD**

- For hypercapnic patients with a low arterial pH due to an uncompensated *respiratory* acidosis
- Can be safely applied to encephalopathic patients as long as they have intact cranial reflexes (e.g., gag/cough) and the encephalopathy is not from another cause
BiPAP - COPD

- Important to ensure that the chosen settings provide adequate support
- EPAP/PEEP can usually be set at 5-10 cm H$_2$O
- IPAP/Pressure support should be titrated to ensure adequate ventilation to reverse the CO$_2$ retention

Crit Care Med 2007 Vol. 35, No. 10
A good rule of thumb is that it is unlikely to reverse a significant respiratory acidosis without a minute ventilation greater than 10L. This typically requires a tidal volume of ~500mL.
BiPAP - COPD

- If the patient deteriorates or shows no improvement after a few hours on adequate settings, intubation should be strongly considered.
- If improvement is made, however, it can safely be continued for extended periods of time.
There is a general lack of data (and consequently consensus) on the use of BiPAP for asthma exacerbations. Reasonable to give a trial under close monitoring with preparations in place for intubation if necessary. Encephalopathic asthma patients should not be offered NIV.
BiPAP – Post admission

- For patients who deteriorate after leaving the ED, BiPAP is still appropriate but even greater caution should be exercised in asthmatics
Post-admission

- Monitor oxygenation
- Daily PEF can be helpful in asthma, less likely in COPD
- Once initial distress has resolved, home inhaled medications should be restarted on top of the short-acting inhalers/nebs ordered on admission
Post-admission/Pre-discharge

- If on an inhaled steroid, increasing the dose should be strongly considered, particularly in asthmatics.
- An effort should be made to optimize outpatient therapy on discharge to prevent future admissions.
Pre-discharge

- Pneumococcal and influenza vaccines should be given when appropriate
- Pneumococcal vaccine has not been proven to reduce admissions but influenza vaccine has
- Smoking cessation
- Evaluation for home oxygen
Optimizing outpatient care

- If not on a long-term controller medication at admission one should absolutely be started on discharge
- Inhaled medications - *with* inhaler technique training
- COPD: LAMA ➔ LABA ➔ ICS
- Asthma: ICS ➔ LABA ➔ LAMA
Optimizing outpatient care

- Oral medications to prevent COPD admissions:
  - Azithromycin
  - Roflumilast
  - Theophylline
  - Steroids?
Optimizing outpatient care

- Azithromycin (250mg daily or qMWF) is recommended by the ACCP and other national societies but not the GOLD guidelines
- Concerns for macrolide resistance, QT prolongation/arrhythmia, hearing loss
- Does not appear to be effective in current smokers
Optimizing outpatient care

- Contraindications to azithromycin therapy:
  - Hearing loss
  - Resting tachycardia (Afib is relative)
  - Baseline QTc > 450 or use of other medications known to prolong QTc
Optimizing outpatient care

- Roflumilast has fewer contraindications and potential for serious side effects but generally works only for those with a chronic bronchitis phenotype and is substantially more expensive.
Optimizing outpatient care

- Low-dose oral theophylline is less effective than either of the prior two choices but still included in the guidelines
- Long term steroid therapy for COPD is not recommended by any guideline or society (is appropriate in rare cases for asthma)
Readmissions

- COPD is part of the CMS readmissions program as a “core measure” and hospitals can be penalized for high readmission rates.
- As such, a major focus on the inpatient care should be to prevent readmissions (< 30 days).
Readmissions

- First step is to identify patients at high risk for readmission
Risk factors for readmission

- African-American race
- Male gender
- Longer LOS
- Hypercapnia, esp. at baseline
- Low BMI
- Dual eligibility for medicare/medicaid

*Chest. 2016 May 7. pii: S0012-3692(16)48969-5*
Risk factors for readmission

- Discharge to post-acute care facility
- Comorbidities:
  - CHF
  - Frailty
  - Psychiatric disease
  - Other conditions such as diabetes or kidney disease; risk increases with increasing number of conditions
Proven interventions to prevent readmission

- Optimizing outpatient care/patient self-management
- Inhaler device training
- Early outpatient follow up (30 days)
Patient self-management

- Patients need to know which inhaler is which, when to use them, and how to use them (inhaler teaching)
- Less than half of patients really understand any of these very fundamental and crucial parts of their care and only a small minority (15%) know how to use inhalers
Patient self-management

- Patients should also be educated on diet, exercise, smoking cessation
- Action plans/coping strategies to aid in treating worsening symptoms at home (preferably early) instead of seeking urgent medical care
Optimizing outpatient management

- Already discussed optimizing their lung disease
- Do not neglect comorbidities, particularly CAD/CHF
- Beta blockers?
Beta blockade in COPD

- Cardioselective beta blockers are not only safe for use in patients with COPD but are associated with better overall outcomes
- Trials are actually underway to evaluate the use of beta blockers to prevent COPD exacerbations

BMJ Open. 2016 Jun 7;6(6):e012292
Beta blockade in asthma

- Cardioselective agents are also considered safe but greater caution advised as single-dose studies do show a decrease in FEV1 and slightly blunted response to albuterol.
Beta blockade in asthma

- However, they are not contraindicated for use in patients with an appropriately strong indication
- The effect on beta receptors in the lung is complex and seems to fade with longer-term use
Early outpatient follow up

- 1/3 of patients who do get re-admitted do so within the first week after discharge
- Follow up with PCP or pulmonologist within a month has been shown in both US and European studies to reduce readmissions at 30 and 90 days
Early outpatient follow up

- Many healthcare systems are setting up post-discharge clinics
- Particularly useful for uninsured patients or those who do not have an established physician with whom reliable follow up can be arranged
Possible interventions to prevent readmission

- Pulmonary rehab (30 days)
- Telehealth
- Pharmacist-supervised medication reconciliation
- d/c from the ED with closely supervised care at home (home health nurse/aide)
Possible interventions to prevent readmission

- Medications: Roflumilast, Azithromycin

Home BiPAP

- Small pilot studies show a reduced rate of re-admission (at 1 year) in high-risk patients
- Defined as severe COPD with one or more episodes of acute hypercapnic respiratory failure in 1 year

*J Tuberc Lung Dis.* 2010 May;14(5):642-9; *Eur Clin Respir J.* 2016 Mar 31;3:28303
Home BiPAP

- Covered by medicare for COPD if:
- Patient does not have OSA
- Awake PaCO$_2$ of 52mm Hg or greater on ABG or has nocturnal hypoxia on 2L O$_2$ (or patient’s baseline requirement if on supplemental oxygen)
Summary

- Acute COPD and asthma exacerbations are a common and costly condition both in healthcare dollars and patient morbidity/mortality
- Treatment for the two conditions is not identical but there is significant overlap
Summary

- Initial evaluation/treatment should focus on identifying high risk or more acutely ill patients, especially in asthmatics
- High dose inhaled bronchodilators and systemic corticosteroids should be given promptly to all but the most mildly symptomatic patient
Summary

- Unlike COPD, antibiotics are rarely indicated for asthma exacerbations.
- Optimizing the outpatient regimen is too often overlooked as a key component of inpatient care.
- Particularly as readmissions are a CMS core measure and used as an indicator of hospital quality.
There are proven interventions to aid in reducing the risk of readmissions. Patient education/self management, optimized outpatient treatment (including comorbid conditions), and good follow up are high quality/low cost means of doing so.
Questions?