

CASE: 68 year-old man with a history of CAD s/p CABG, COPD, who noticed increasing dyspnea on exertion for the past week during the spring season. He normally uses albuterol MDI 2 puff bid, atrovent MDI 2 puffs bid and fluticasone MDI 1 puff bid. He has used his albuterol MDI more frequently with minimal relief of his symptoms. He denies lower extremity edema or weight gain. His Vitals 156/92 HR 98 RR 23 O2 sat RA 93%. His exam is notable for new productive cough and diffuse expiratory wheezes. Labs were remarkable for ABG on RA 7.30/PO₂ 74/PCO₂ 50. What is your differential for his dyspnea? Should the patient be admitted to the hospital? What initial tests would you order and why? What would be your initial treatment for his dyspnea?

Inpatient Management of Chronic Obstructive Pulmonary Disease

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COPD typically encompasses a variety of conditions including chronic bronchitis 85%, emphysema 15%, asthma and bronchiectasis.

Precipitants for Acute Exacerbations:

- Infections (pulmonary and non-pulmonary)
- Environmental exposures (change in weather)
- Non-compliance with medications
- Other clinical conditions, such as heart failure, non pulmonary infections, pulmonary embolus, pneumothorax

Common Infectious Causes in Exacerbations (not validated): Hemophilus influenza(22%), Pseudomonas aeruginosa(15%), Streptococcus pneumoniae(10%), Moraxella catarrhalis(9%), Mycoplasma pneumoniae and Chlamydia pneumoniae(1-10%), viral (50%).

Diagnosis

Guidelines to Assess Severity of COPD in stable patients

	Postbronchodilator FEV ₁ /FVC	FEV ₁ predicted ERS	FEV ₁ predicted ATS	FEV ₁ predicted BTS
Mild	≤0.70	≥70	≥50	≥60
Moderate	≤0.70	50-69	35-49	40-59
Severe	≤0.70	< 50	< 35	< 40
Very Severe	≤0.70			

American Thoracic Society (ATS), British Thoracic Society (BTS), European Respiratory Society (ERS)

Signs and Symptoms of Acute Exacerbation/Flare: Worsening dyspnea, Increased sputum production/volume, and increased sputum purulence.

- The most common staging used to assess acute severity is the Anthonisen Staging. Severity is based on the number of signs/symptoms present.
 - Type 1 (severe)-3 findings
 - Type 2 (moderate)-2/3 findings
 - Type 3 (mild)-at least 1 finding
- Factors that may contribute to exacerbations: severity of COPD, history of previous exacerbations, presence of co-morbidities

Physical Examination:

Accessory muscle use—seen in over 90% of patients hospitalized with COPD exacerbation, < 50% by hospital day #5, wheezing audible without a stethoscope, pursed lip appearance, poor airway entry on lung auscultation, inspiratory and expiratory wheezing on auscultation (LR 6.0), early inspiratory crackles (LR 14.6) and absence of cardiac dullness (LR 11.8) is strongly suggestive of obstructive lung disease, early inspiratory wheezing implies that lung disease is severe with FEV₁/FVC < 0.44 (LR 20.8).

Diagnosis:

- **Arterial Blood Gas (ABG)** may be helpful in patients upon admission, indirect evidence for ABG use, which shows disease severity and identifying patients who need oxygen or mechanical ventilation
- **Sputum Evaluation**
 - There are not enough data to support this, but it may be helpful in narrowing antibiotic coverage if infection is suspected
- There are no good data to recommend ancillary tests
- Order a complete blood count to exclude infection, chemistry and ECG to determine an etiology for the acute exacerbation.

Chest X-Ray(CXR)

Should be obtained upon admission. Ideally a PA and lateral should be ordered, but if unable, AP may be sufficient, depending on patient effort

3 observational studies found it useful to note the presence of infiltrates or congestive heart failure

Prospective study of 128 hospitalized patients showed a change in management in 21% of patients based on the CXR

Spirometry/PEAK EXPIRATORY FLOW RATE (PEFR)

Not recommended in an acute exacerbation during a patient's hospitalization. 3 observational studies showed spirometry had limited use at the time of presentation, one study of 70 patients showed that a FEV₁ at presentation correlated with PCO₂ and pH but not PO₂. Another study with 199 patients showed a correlation with FEV₁ and peak expiratory flow rate in patients with an exacerbation.

Who Should be Hospitalized?

Patients with co-morbid conditions including pneumonia, heart arrhythmias, heart failure, diabetes, renal or liver failure, inadequate response to outpatient therapy, worsening hypoxemia or hypercapnia, change in mental status, uncertain diagnosis.

Management based on ATS, BTS, ERS Guidelines

Bronchodilators(β-agonists,anticholinergic agents)

- First line therapy
- Cause smooth muscle relaxation and improved lung emptying
- Combining long acting β-agonist (albuterol, salmeterol) and ipratropium lead to fewer exacerbations
- β-agonists have not been shown to be better than anticholinergics (ipratropium, tiotropium)
- β-agonists have a quicker onset of action
- β-agonists have more side effects than anticholinergics including headache, tremor, palpitations, nausea, vomiting
- The toxicity profile of methylxanthines make them potentially harmful, but it can be useful if patients have failed other therapy such as steroids.
- ERS and BTS advocate the use of nebulizers and ATS supports the use of MDIs **with spacers** for exacerbations. Studies have shown no difference in efficacy between nebulizers or MDIs.

Other bronchodilators (methylxanthines-theophylline and aminophylline)

- These should be reserved for patients who have failed other therapies, including β -agonist, anticholinergics, and steroids.

Corticosteroids

- ERS supports the use of IV corticosteroids and to a lesser degree ATS and BTS
- Optimal dose and duration is unknown but support for 5-10 days.
- Generally, ERS and ATS recommend prednisone 30-40 mg orally daily for 10 days **without a taper** for mild to moderate COPD exacerbations.
- If patients are unable to tolerate oral, then an IV equivalent dose (prednisone 30-40 mg=solumedrol 24-32 mg IV) should be given.
- Systemic Corticosteroids in Chronic Obstructive Pulmonary Disease Exacerbations (SCCOPE) Trial
 - 271 VA patients
 - Placebo vs. IV solumedrol 125 mg q6 hours followed by oral steroids
 - Patients on steroids showed improved FEV₁ of about 0.1 L within the first 3 days
 - No difference in 2 week or 8 week steroid regimen of FEV₁
- It is reasonable to treat patients with moderate to severe acute COPD with solumedrol 125 mg q6 hours or prednisone 60 mg q 24hours for 3 days then continue steroids at above doses for total of 10 days.
- Corticosteroid MDIs, such as fluticasone, triamcinolone, should be considered in patients not previously on these and who have had multiple hospitalizations for exacerbations. Note: Corticosteroid MDIs may have systemic effects just like oral steroids.

Antibiotics

- Current recommendation by ERS, ATS, and BTS is to treat Anthonisen 1 patients with antibiotics for 5-7 days.
- Antibiotic choice should be based on local bacterial resistance
- Antibiotic options include doxycycline, azithromycin, bactrim, amoxicillin/clavulanate, and possibly fluoroquinolones
- If Pseudomonas is suspected, additional antibiotic may be needed
- There are no studies showing that the newer antibiotic agents are superior to older generation antibiotics.

Oxygen

- ERS and ATS advocate its use with ABG monitoring
- Goal of inpatient oxygen therapy should be PaO₂ > 60 mmHg or SpO₂ > 90% to prevent tissue hypoxia.
- Prevention of tissue hypoxia should be the primary goal. Oxygen therapy should not be withheld for fear of CO₂ retention. If this occurs then ventilatory support needs to be considered.

Mucolytics

- Do not shorten disease course but may improve symptoms
- Not recommended

Chest Physical Therapy

- A few studies show chest physical therapy is actually ineffective and may be detrimental in acute exacerbations.

Ventilatory Support

- Supported in appropriate situations
- Consider mechanical ventilation if a patient has a pH <7.35, hypercapnia (PCO₂ >45-60 mmHg), increased respiratory rate >24 breaths per minute sustained.

Non-invasive mechanical ventilation

- Indications listed above
- Non invasive positive pressure ventilation (equivalent of CPAP with pressure support)
May be a good first step in avoiding invasive ventilation, there are some contraindications to NPPV such as hemodynamic instability, altered mental status, inability to cooperate, facial or nasopharyngeal trauma, inability to protect airway, respiratory arrest, arrhythmias.
- Negative pressure ventilation (not used very often)

Invasive mechanical ventilation (endotracheal intubation)

Predictors for Outpatient Relapse

- Return to the ER <14 days after initial presentation
- Lower baseline FEV¹
- Low PO₂
- High PCO₂
- Low pH
- Those who receive more bronchodilator treatment in the ER

There are no good data to recommend discharge criteria

Case Follow Up

It was thought that the change in season caused the patient to develop an acute exacerbation. He was treated with supplemental oxygen, bronchodilator nebulizers initially as well as oral prednisone 40 mg daily. He was empirically started on oral azithromycin 250 mg daily for 5 days for increased sputum production. He did well in the hospital and was discharged with prednisone 30 mg daily for 5 days and azithromycin. In addition, the patient was given a spacer to use with his MDIs which he did not have prior to admission.

Clinical Pearls

- Determine the etiology for exacerbation and treat accordingly.
- CXR and ABG are helpful upon admission
- Spirometry not advised in the acute setting
- Consider inhaled anticholinergics first over beta agonists given fewer side effects
- Antibiotics recommended for Anthonisen 1; try to use narrow spectrum antibiotics given resistance rates
- If patients smoke, counsel regarding smoking cessation
- Patients should receive a Pneumovax and an annual influenza vaccination
- Patients should be on a β -agonist, anticholinergics MDIs and steroid (oral or MDI) upon discharge.

References

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