Academic Half Day COPD

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Question 1

62 year old male, active smoker, presents to your office to establish care.

After review of his history, you find that he meets criteria for lung cancer screening based on USPSTF guidelines and send him for a low dose chest CT.

What is his diagnosis based on this CT image?

- A. Bronchiectasis
- B. Asthma
- C. Emphysema
- D. Idiopathic Pulmonary Fibrosis
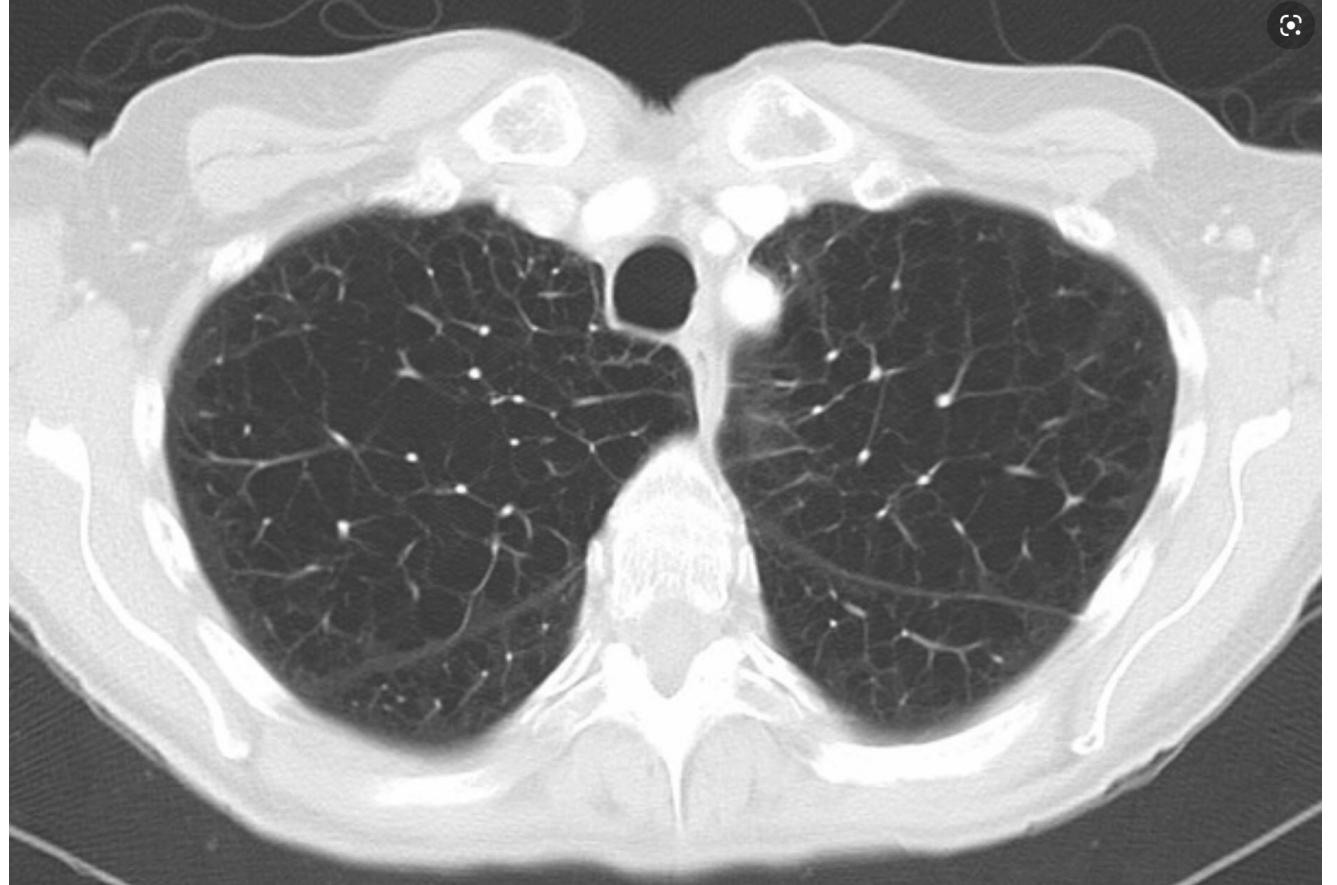
# How do we define COPD based on pathology?

Figure 9.54 Emphysema. Paper-thin Gough-Wentworth sections prepared from whole lungs. (A) Centriacinar emphysema in a smoker. (B) Panacinar emphysema in α_1-antitrypsin deficiency. (Original Gough sections courtesy T.V. Colby and the Charles B. Carrington Memorial Lung Pathology Library.)

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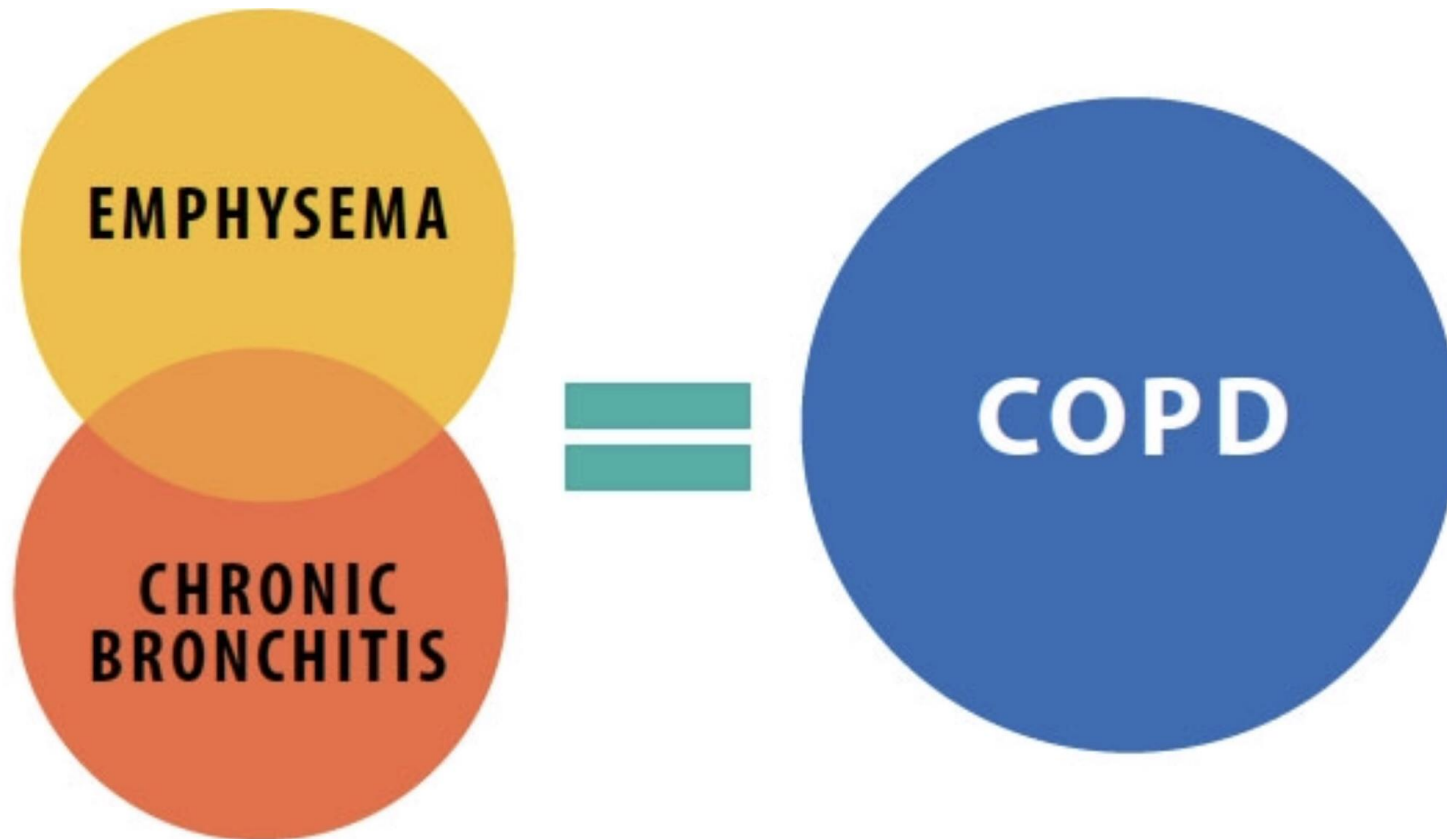
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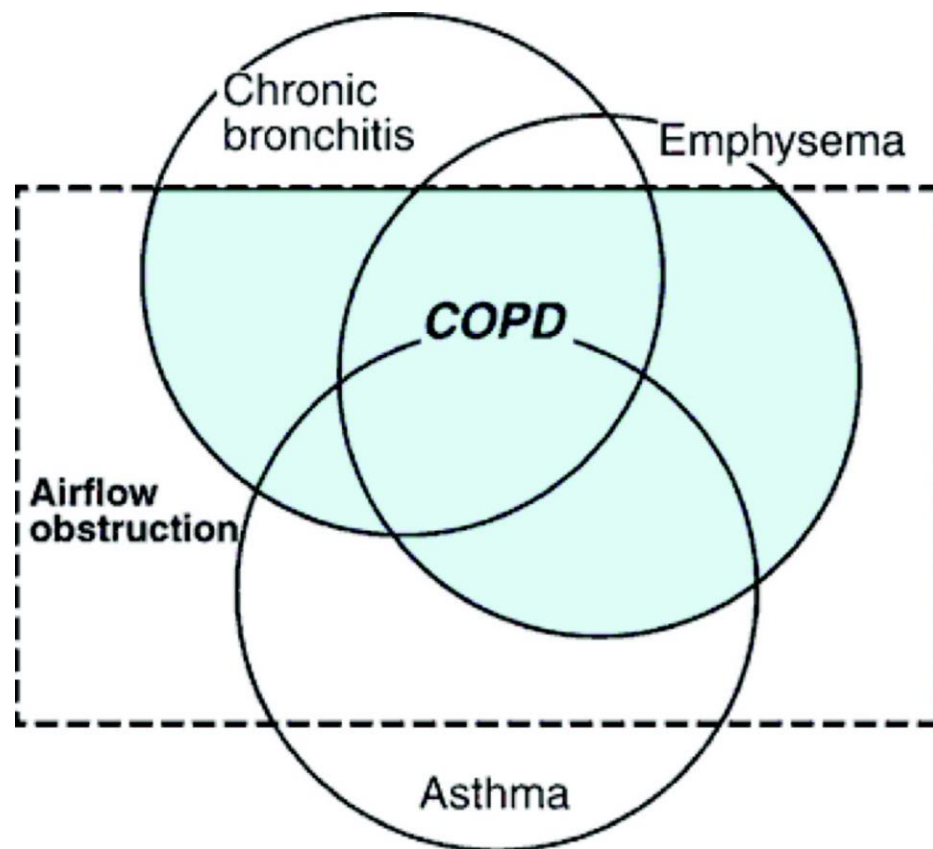
Question 2a

A 62-year-old man presents to your clinic with a 2-year history of increasing shortness of breath. His symptoms are worse when he walks up steps or lifts heavy objects. He also has an occasional nonproductive cough. His medical history is significant for hypertension, and his only medication is chlorthalidone. He is a construction worker and worked in a steel mill when he was in high school. He quit smoking 1 year ago.

His physical exam is significant for a mildly prolonged expiratory phase on lung auscultation but is otherwise normal; no wheezes or crackles are noted.

Chest radiograph shows mildly increased lung markings but no focal findings.

Spirometry shows an FEV1/FVC ratio of 65%, an FEV1 of 52% of predicted, and an FVC of 80% of predicted. Lung volumes show a total lung capacity of 120% of predicted, a residual volume of 125% of predicted and a DLCO of 65% of predicted.

What spirometry value defines airflow limitation and confirms the diagnosis of COPD with the appropriate clinical history?

- A. FEV1
- B. DLCO
- C. TLC or FVC
- D. FEV1/FVC

How do we define COPD based on spirometry?

- ATS/ERS Guidelines for diagnosis of COPD based on spirometry:
  - Reduced FEV1/FVC ratio below the 5th percentile of the predicted value (Lower limit of normal – LLN)
- GOLD Guidelines for diagnosis of COPD based on spirometry:
  - Reduced FEV1/FVC ratio below 0.7

Question 2b

A 62-year-old man presents to your clinic with a 2-year history of increasing shortness of breath. His symptoms are worse when he walks up steps or lifts heavy objects. He also has an occasional nonproductive cough. His medical history is significant for hypertension, and his only medication is chlorthalidone. He is a construction worker and worked in a steel mill when he was in high school. He quit smoking 1 year ago.

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What is his grade of airflow limitation?

- A. Mild
- B. Moderate
- C. Severe
- D. Very Severe

What are the GOLD stages?

Why do we track the grade of airflow limitation?

| Spirometrically Confirmed Diagnosis | > | Assessment of airflow limitation |

Post-bronchodilator
$FEV_1/FVC < 0.7$

Grade	FEV_1 (% predicted)
GOLD 1	≥ 80
GOLD 2	50-79
GOLD 3	30-49
GOLD 4	< 30

What are the GOLD stages?

Why do we track the grade of airflow limitation?

- The change over time can help to determine prognosis
- It is used to determine candidacy for lung volume reduction and lung transplant

| Spirometrically Confirmed Diagnosis | Assessment of airflow limitation |

| Post-bronchodilator $FEV_1/FVC < 0.7$ |

Grade	FEV_1 (% predicted)
GOLD 1	≥ 80
GOLD 2	50-79
GOLD 3	30-49
GOLD 4	< 30

Question 2c

A 62-year-old man presents to your clinic with a 2-year history of increasing shortness of breath. His symptoms are worse when he walks up steps or lifts heavy objects. He also has an occasional nonproductive cough. His medical history is significant for hypertension, and his only medication is chlorthalidone. He is a construction worker and worked in a steel mill when he was in high school. He quit smoking 1 year ago.

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What GOLD group does he fall under?

- A. Group A
- B. Group B
- C. Group C
- D. Group D

What are the GOLD groups?

mMRC

- 0: Not troubled by breathless except on strenuous exercise

- 1: Short of breath when hurrying or walking up a hill

- 2: Walks slower than contemporaries on the level because of breathlessness or has to stop for breath when walking at own pace on level

- 3: Stops for breath after walking 100 m or after a few minutes on the level

- 4: Too breathless to leave the house or breathless with dressing or undressing
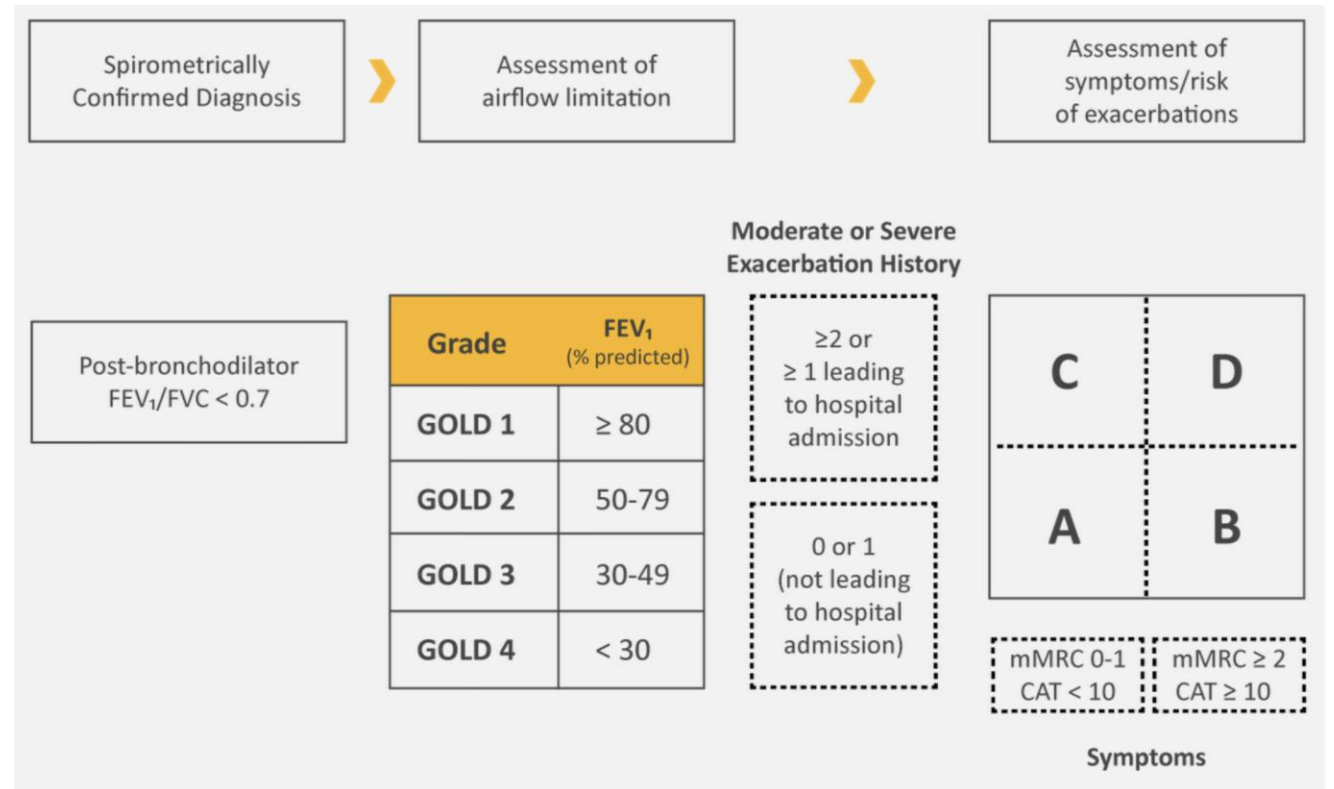
Question 2d

A 62-year-old man presents to your clinic with a 2-year history of increasing shortness of breath. His symptoms are worse when he walks up steps or lifts heavy objects. He also has an occasional nonproductive cough. His medical history is significant for hypertension, and his only medication is chlorthalidone. He is a construction worker and worked in a steel mill when he was in high school. He quit smoking 1 year ago.

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What would be the appropriate initial treatment option?

- A. Advair Diskus (LABA/ICS)
- B. ProAir HFA (SABA)
- C. Spiriva Respimat (LAMA)
- D. Trelegy Ellipta (LABA/LAMA/ICS)

How do we determine initial treatment?

INITIAL PHARMACOLOGICAL TREATMENT

≥ 2 moderate exacerbations or ≥ 1 leading to hospitalization	**Group C** LAMA	**Group D** LAMA or LAMA + LABA* or ICS + LABA** *Consider if highly symptomatic (e.g. CAT > 20) **Consider if eos ≥ 300
0 or 1 moderate exacerbations (not leading to hospital admission)	**Group A** A Bronchodilator	**Group B** A Long Acting Bronchodilator (LABA or LAMA)
	mMRC 0-1 CAT < 10	mMRC ≥ 2 CAT ≥ 10

*Consider if highly symptomatic (e.g. CAT>20)
**Consider if eos ≥300"

Question 2e

A year passes away, and the same gentleman presents again to your clinic for his yearly follow up.

He reports that he now has more and more difficulty keeping up with his wife when walking around the mall.

He also reports that he had an acute COPD exacerbation 5 months ago. He was seen in an urgent care and given antibiotics and steroids.

The urgent care also started him on a Spiriva Handihaler, which he continues using daily.

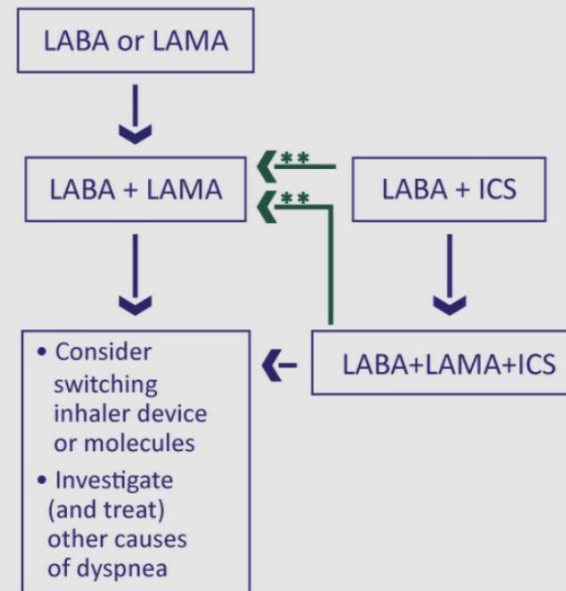What would be the most appropriate therapy for him at this time?

- A. Symbicort HFA (LABA/ICS)
- B. Brovana Nebulized (LABA)
- C. Stiolto Respimat (LABA/LAMA)
- D. Trelegy Ellipta (LABA/LAMA/ICS)
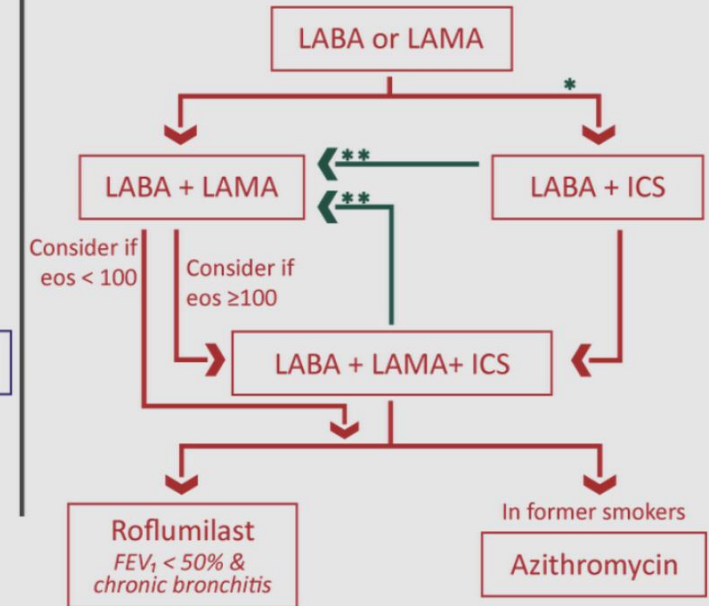
How do we adjust our treatment plan?

FOLLOW-UP PHARMACOLOGICAL TREATMENT

1. IF RESPONSE TO INITIAL TREATMENT IS APPROPRIATE, MAINTAIN IT.
2. IF NOT:
   - ✓ Consider the predominant treatable trait to target (dyspnea or exacerbations)
     - Use exacerbation pathway if both exacerbations and dyspnea need to be targeted
   - ✓ Place patient in box corresponding to current treatment & follow indications
   - ✓ Assess response, adjust and review
   - ✓ These recommendations do not depend on the ABCD assessment at diagnosis

• DYSPNEA •

LABA or LAMA → LABA + LAMA

LABA + ICS

LABA+LAMA+ICS

- Consider switching inhaler device or molecules
- Investigate (and treat) other causes of dyspnea

• EXACERBATIONS •

LABA or LAMA → LABA + LAMA

LABA + ICS

Consider if eos < 100
Consider if eos ≥100

LABA + LAMA+ ICS

Roflumilast
FEV_1 < 50% & chronic bronchitis

In former smokers
Azithromycin

eos = blood eosinophil count (cells/µL)
* Consider if eos ≥ 300 or eos ≥ 100 AND ≥2 moderate exacerbations / 1 hospitalization
** Consider de-escalation of ICS or switch if pneumonia, inappropriate original indication or lack of response to ICS

FIGURE 4.3

Question 3a

You receive a call to admit a 67-year-old woman who presented to the ED with a 2-day history of fever, dyspnea, and increased cough with production of green sputum. She has severe COPD, which was diagnosed 2 years ago. She used albuterol several times yesterday with no relief of dyspnea, and she was unable to sleep last night. Her last spirometry, performed 6 months ago, showed an FEV1 of 48% of predicted. She is a current smoker with a 24-pack-year history. Medications are tiotropium and as-needed albuterol.

Vitals are significant for a temperature of 38.9 °C (102.0 °F), HR of 118/min, and RR of 30/min. Oxygen saturation is 82% breathing ambient air. Pulmonary examination reveals bilateral diffuse expiratory wheezing.

After an albuterol nebulizer treatment and breathing 2 L of oxygen by nasal cannula, oxygen saturation is 91%. She remains tachypneic with bilateral expiratory wheezing.

Chest radiograph shows no infiltrate.

What defines this women's condition as an acute exacerbation of COPD?

- A. Active tobacco use
- B. Presence of a respiratory infection
- C. Acute worsening of respiratory symptoms
- D. Exclusion of other causes of dyspnea

How do we define an acute COPD exacerbation?

- GOLD Guidelines define a COPD exacerbation as "an acute event characterized by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and leads to a change in medication."

- Bacterial and viral respiratory infections are the main instigators, but there are other non-infectious causes including air pollution and acute PE.

Question 3b

You receive a call to admit a 67-year-old woman who presented to the ED with a 2-day history of fever, dyspnea, and increased cough with production of green sputum. She has severe COPD, which was diagnosed 2 years ago. She used albuterol several times yesterday with no relief of dyspnea, and she was unable to sleep last night. Her last spirometry, performed 6 months ago, showed an FEV1 of 48% of predicted. She is a current smoker with a 24-pack-year history. Medications are tiotropium and as-needed albuterol.

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After an albuterol nebulizer treatment and breathing 2 L of oxygen by nasal cannula, oxygen saturation is 91%. She remains tachypneic with bilateral expiratory wheezing.

Chest radiograph shows no infiltrate.

In addition to continuing this patient's supplemental oxygen and short-acting bronchodilator, which of the following is the most appropriate treatment?

- A. Azithromycin and prednisone
- B. Clarithromycin and fluticasone
- C. Doxycycline and salmeterol/fluticasone
- D. Erythromycin and roflumilast

Bronchodilators, Steroids, and Antibiotics

- In the outpatient setting, corticosteroids decrease treatment failure and improve FEV1 and oxygenation.
  - These benefits are greater in patients with an eosinophil count > 2%.
- In the inpatient setting, corticosteroids decrease hospital length of stay and increase the rate of recovery in addition to the benefits mentioned above.
  - However, there is no improvement in mortality with steroids.
  - Short courses are not inferior to longer courses and oral is not inferior to IV.
- Antibiotics are to be reserved for patients with at least 2 of the following:
  - Increased cough
  - Increased sputum volume
  - Increased sputum purulence

Question 4

A 63-year-old man is admitted to the ICU for an exacerbation of COPD. He has a 10-year history of COPD. He recently developed a viral upper respiratory tract infection that worsened his baseline dyspnea, and his family reports increased use of his rescue inhaler. He was brought to the hospital because he became confused. His medical history is otherwise unremarkable. His medications are tiotropium and fluticasone/salmeterol and albuterol PRN.

Vitals are significant for a RR of 32/min; BMI is 20. Oxygen saturation is 86% breathing 60% oxygen by Venturi mask.

On physical examination, he is responsive but confused and disoriented. He is using accessory muscles of breathing. On oral examination, pooling of secretions in the posterior pharynx and diminished gag reflex are noted. There is no jugular venous distention. Pulmonary examination reveals transmitted upper airway noise and decreased breath sounds with polyphonic end-expiratory wheezing heard throughout both lung fields. There is clubbing but no peripheral edema.

A chest radiograph demonstrates hyperinflation but no infiltrates. Laboratory studies show a leukocyte count of 11,000/μL and a hematocrit of 32.8%. Arterial blood gases (breathing 60% oxygen) show pH 7.25, PCO2 72 mm Hg, and PO2 48 mm Hg.

Glucocorticoids, antibiotics, and nebulized albuterol are started. Which of the following is the most appropriate next step in management?

- A. Increase oxygen to 100% by non-rebreather mask
- B. Start noninvasive ventilation with continuous positive airway pressure
- C. Start noninvasive ventilation with inspiratory pressure support and positive end-expiratory pressure
- D. Intubate and start mechanical ventilation

How do we treat COPD exacerbations in the ICU?

- In the ICU, IV steroids have been shown to decrease days of mechanical ventilation and reduce the rate of non-invasive ventilation failure (benefit not seen with use of oral steroids).

- Non-invasive positive pressure ventilation has been shown to reduce in hospital mortality and hospital length of stay

- Intubate if impending respiratory failure or with hemodynamic instability or if there are contraindications to non-invasive ventilation

Question 5

A 70-year-old man is evaluated in follow-up for COPD, which was diagnosed 1 year ago. He has had two exacerbations in the last year, with the second exacerbation 1 month ago. At baseline, he has a chronic cough with mucoid sputum consistently for the last 3 years. Sputum culture 6 months ago grew Haemophilus influenzae and mycobacterium avium complex. He has to stop to catch his breath after walking 100 meters (328 feet). His inhaler technique is good. He quit smoking 2 years ago and completed a pulmonary rehabilitation program 4 months ago. His medications are tiotropium, fluticasone/salmeterol, and as-needed albuterol.

Spirometry performed 3 months ago showed an FEV1 of 32% of predicted and an FEV1/FVC ratio of 50%. Chest radiograph performed last month showed no infiltrate, mass, or increased vascular congestion.

On physical examination, vital signs are normal. Oxygen saturation is 92% breathing ambient air. Pulmonary examination reveals diminished breath sounds.

Which of the following is the most appropriate long-term COPD treatment?

- A. Daily prednisone
- B. Roflumilast
- C. Azithromcyin
- D. Simvastatin

What therapy options do we have to prevent an acute COPD exacerbation?

- Azithromycin:
  - NEJM 2011: Azithromycin 250 mg daily reduced the risk of exacerbation by 27%
  - COLUMBUS Trial 2014:Azithromycin 500 mg 3 times weekly decreased exacerbation rates by 42%

- Roflumilast:
  - Lancet 2009: Roflumilast reduced exacerbations by 17%
  - Lancet 2015: Roflumilast + LABA/ICS decreased exacerbations by 14%

Preventing COPD exacerbations

Inhaled therapy
Long-acting beta-2 agonist + inhaled corticosteroid
Long-acting antimuscarinic agent
Long-acting antimuscarinic agent + long-acting beta-2 agonist

Phosphodiesterase-4 inhibitors
Roflumilast

Mucolytics
N-acetylcysteine 600 mg oral twice daily
Carbocysteine (not available in United States)

Antibiotics
Azithromycin 250 mg daily or 500 mg 3 times weekly

Pulmonary rehabilitation

Vaccinations
Influenza
Pneumococcal

Smoking cessation
Seize the opportunity!

Questions?