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UNIV HOENIX

COPD OUTLINE

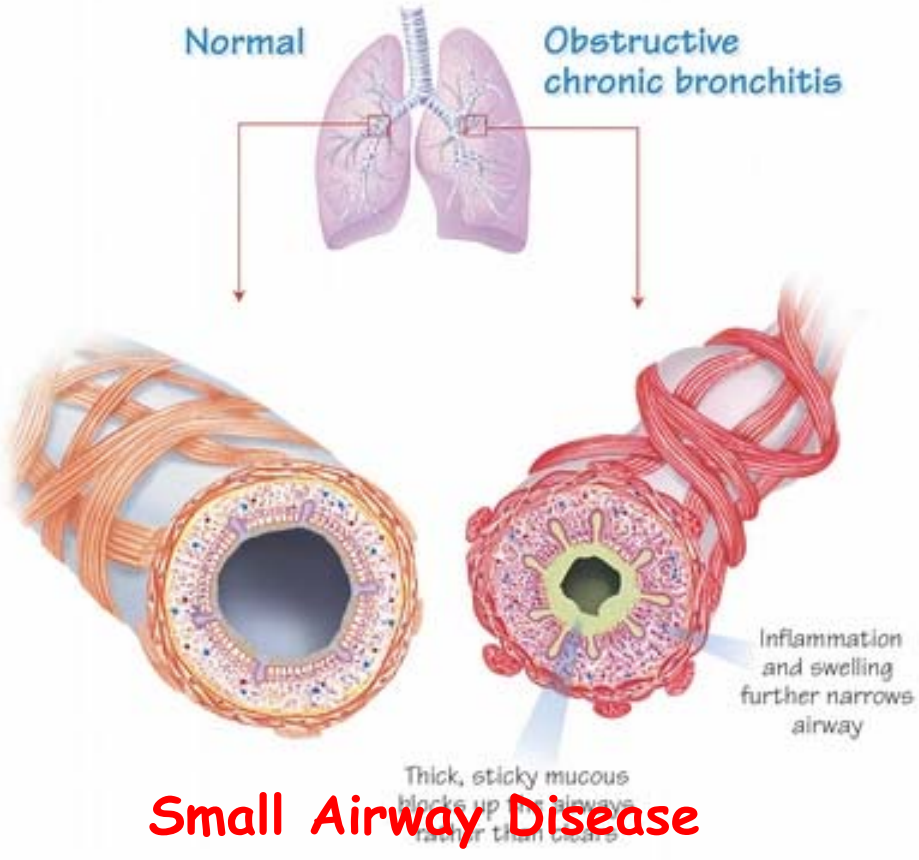
- Definition and Overview
- Pathophysiology
- Diagnosis and Assessment
- Therapeutic Options
- Manage Stable COPD
- Manage Exacerbation
- Manage Comorbidities

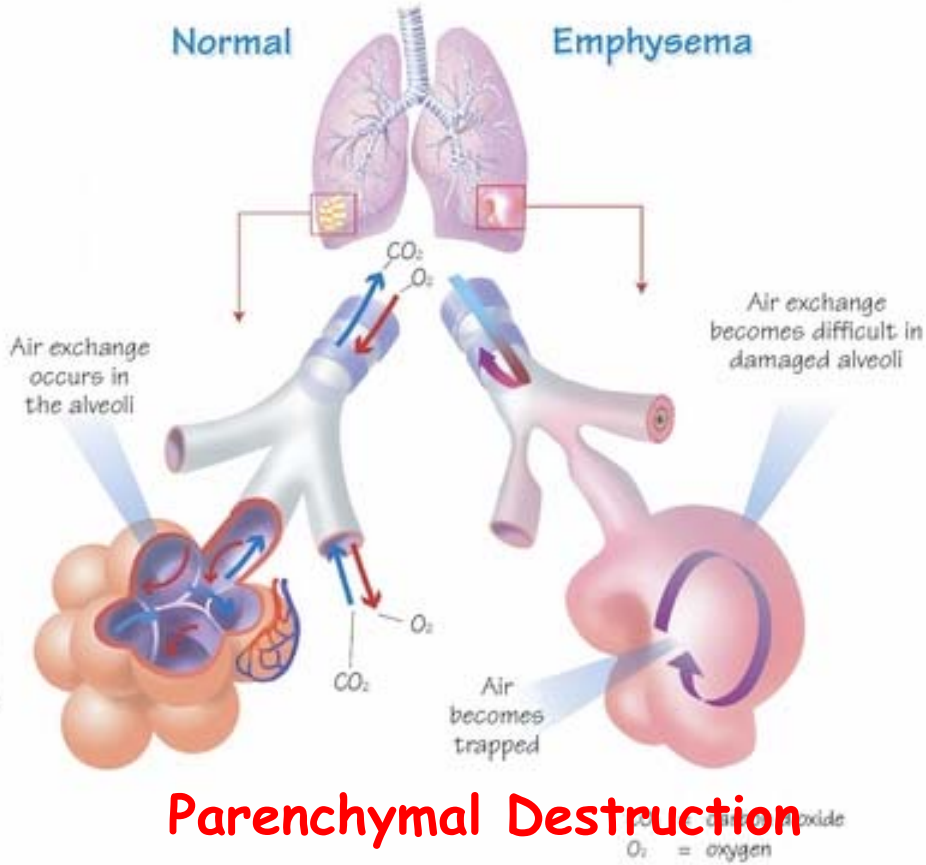
1819

Definition of COPD

- COPD, a common preventable and treatable disease, is characterized by persistent irreversible airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases.
- Exacerbations and comorbidities contribute to the overall severity in individual patients.
- COPD is the third most common cause of death worldwide and major cause of chronic morbidity.

OBSTRUCTIVE CHRONIC BRONCHITIS AND/OR EMPHYSEMA



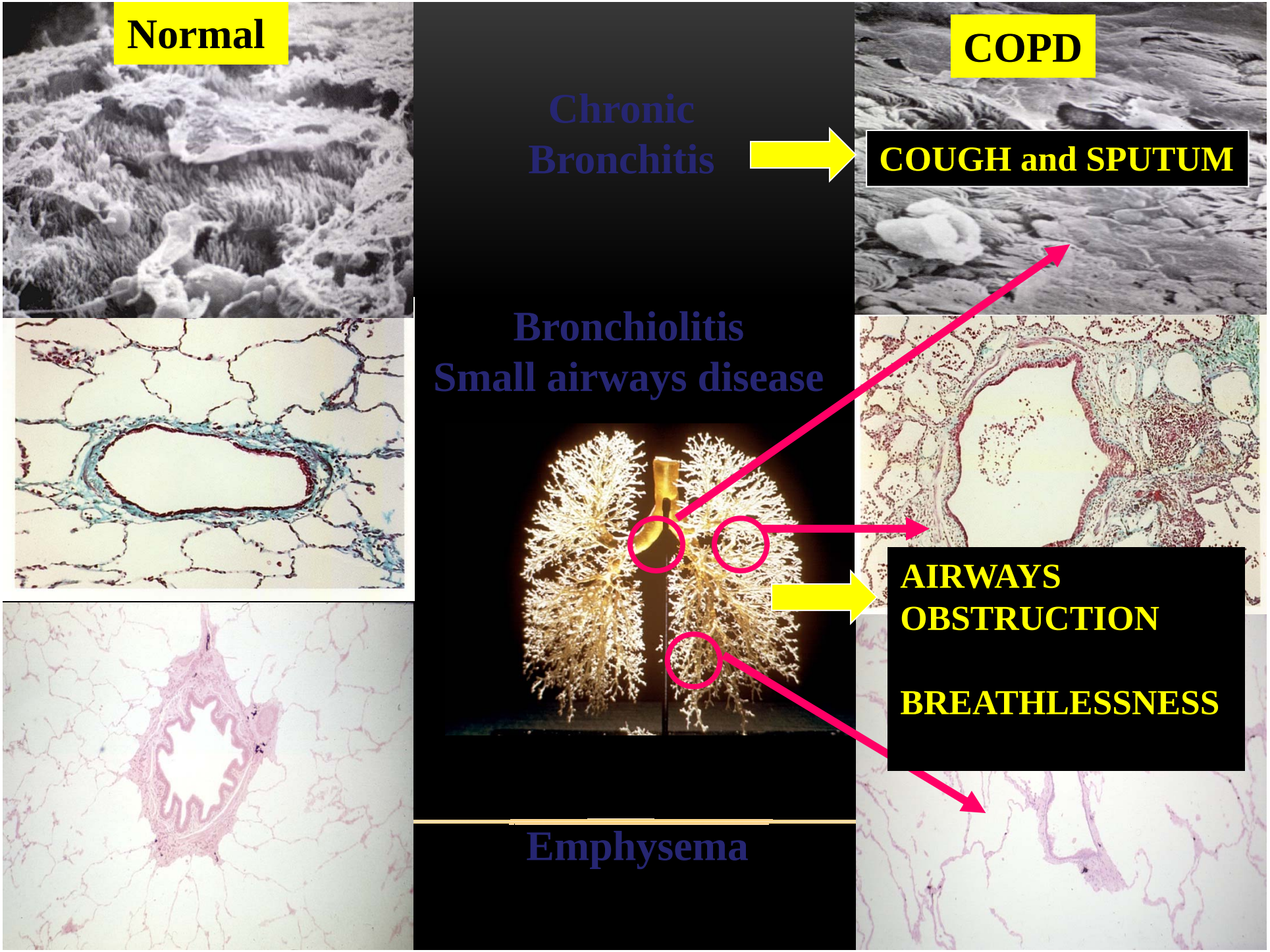


Small Airway Disease

- Luminal plugs
- Airway fibrosis
- Increase airway resistance

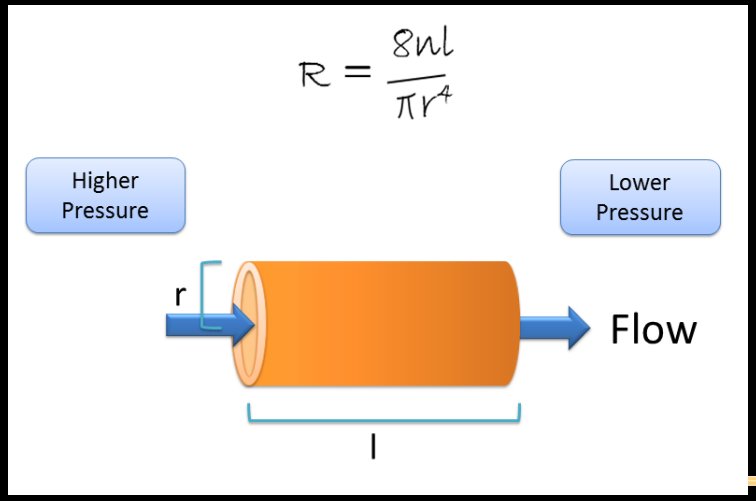
Parenchymal Destruction

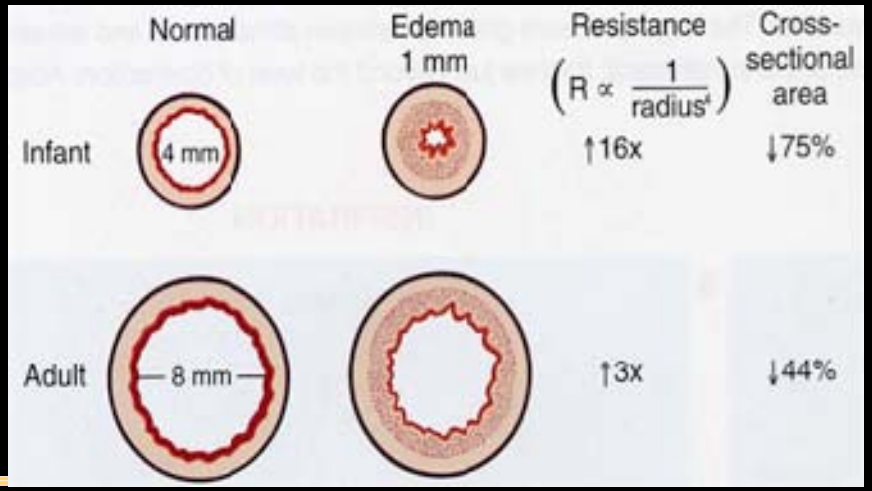
- Loss of alveolar attachments
- Decrease of elastic recoil


Normal
Chronic Bronchitis
COPD
COUGH and SPUTUM
Bronchiolitis Small airways disease
AIRWAYS OBSTRUCTION
BREATHLESSNESS
Emphysema

AIRWAY RESISTANCE

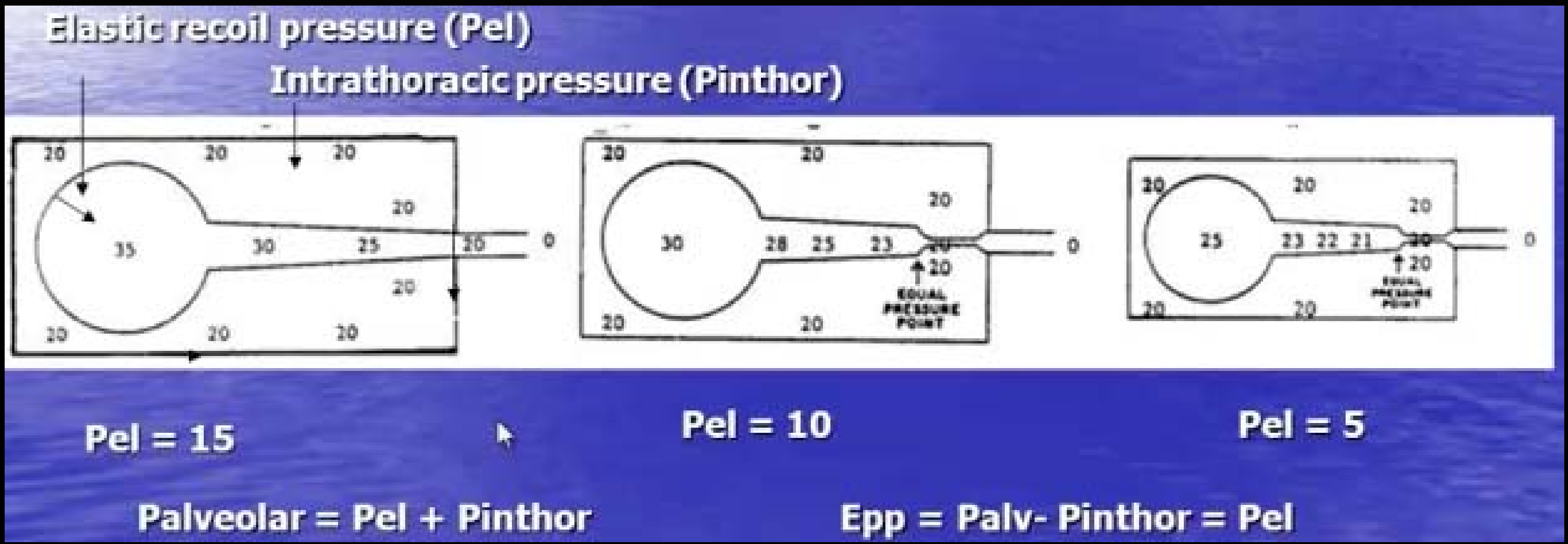
- Flow = Pressure/ Resistance
- ½ radius increases resistance 16 fold
- Work of breathing increases with resistance to flow





DYNAMIC AIRWAY COLLAPSE

Forced Expiration



Normal →→→→→→→→→→→→→→→→→→ Emphysema

Lung volume increases and elastic recoil decreases

RISK FOR COPD

- **SMOKING!!** – 80%

Table 3-24. Risk of COPD Not Related to Smoking

Risk	Comment
Occupational exposures	Coal miners, hard-rock miners, tunnel workers, cement workers, cotton workers (Table 3-25)
Genetic susceptibility	α_1-antitrypsin deficiency with > 90% caused by homozygous PiZZ phenotype; cutis laxa (emphysema in children); metalloproteinase-12 gene mutation
Asthma/bronchial hyperreactivity	Chronic asthma and hyperreactivity can lead to FEV_1 decline and fixed obstruction in nonsmokers
Biomass smoke	Indoor burning of wood, animal dung, crop residue, and coal in poorly ventilated dwellings (primarily affects women)
Poverty	Strong risk factor but unclear if related to combination of poor nutrition, air pollution, etc.
Poor lung development	Bronchopulmonary dysplasia (neonatal chronic lung disease), low birth weight
Infections	Childhood infections, tuberculosis, HIV (accelerated emphysema in smokers)
Air pollution	Outdoor pollution has been shown to be an independent risk factor for decline in FEV_1

FEV_1, 1-second forced expiratory volume; HIV, human immunodeficiency virus.

SYMPTOMS

- Dyspnea that is progressive/persistent/worse with exercise.
- Chronic cough which may intermittent and non productive.
- Chronic sputum production
- History of exposure to risk factors
- Family history

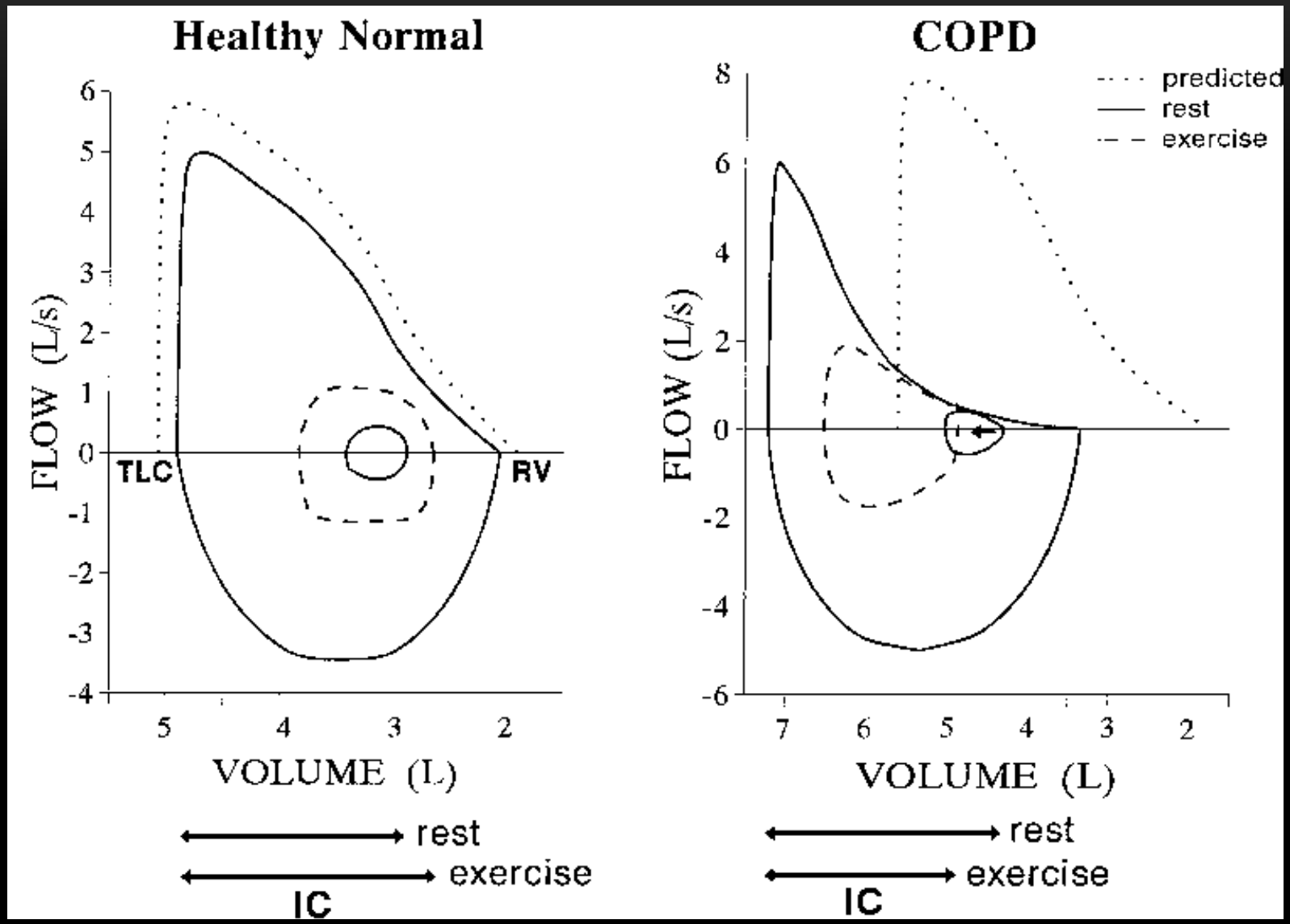
- A 50-year-old man is evaluated for a 2-year history of intermittent, nonproductive, chronic cough, as well as mild dyspnea with exertion. He has not had fever, chest pain, heartburn, loss of appetite, or weight loss. He has a 20-pack-year history of smoking and is a current smoker. His medical history is otherwise unremarkable and he takes no medications.
- PE: BP 125/76 mm Hg, HR 78/min, and RR 15/min; oxygen saturation is 98% breathing ambient air. BMI is 25. He appears comfortable. There is no jugular venous distention. The remainder of the examination is normal.
- CXR and electrocardiogram are normal.

Which of the following is the most appropriate next step in the management?

- A. CT of chest
- B. Polysomnography
- C. Spirometry ✓
- D. Trial of PPI

COPD DIAGNOSIS

- Symptoms include: Dyspnea, chronic cough, chronic sputum production
- History of exposure to risk factors.
- Spirometry is required to make a clinical diagnosis.
- The presence of a POST bronchodilator FEV1/FVC < 70% confirms the presence of persistent airflow limitation and thus of COPD.


Healthy Normal
FLOW (L/s)
6
5
4
3
2
1
0
-1
-2
-3
-4
TLC
RV
5
4
3
2
VOLUME (L)
rest
exercise
IC
COPD
predicted
rest
exercise
FLOW (L/s)
8
6
4
2
0
-2
-4
-6
7
6
5
4
3
2
VOLUME (L)
rest
exercise
IC

- A 62-year-old man is evaluated for declining exercise capacity over the past year. He was diagnosed with moderate COPD 3 years ago. His symptoms had previously been well controlled with tiotropium and as-needed albuterol. He has not had any hospitalizations. He is adherent to his medication regimen, and his inhaler technique is good. He quit smoking 2 years ago. All immunizations are up to date, including influenza and pneumococcal vaccination. A chest radiograph performed 3 months ago for increased cough and sputum production was normal. Pulmonary function testing performed 3 years ago showed an FEV of 58% of predicted, FEV1/FVC ratio of 60%, and a DLCO 85% of predicted.
- PE: VSS. Oxygen saturation is 93% breathing ambient air. No jugular venous distention is noted. The lungs are clear. Cardiac examination reveals normal heart sounds. There are no murmurs. No edema is noted.

WHICH OF THE FOLLOWING IS THE MOST APPROPRIATE MANAGEMENT?

- A. Add Roflumilast
- B. Obtain complete pulmonary function tests
- C. Perform chest CT
- D. Repeat Spirometry ✓
- E. Start oxygen therapy

ASSESSMENT OF COPD

- Assess symptoms
- Assess degree of airflow limitation using spirometry
- Assess risk of exacerbations
- Assess comorbidities

ASSESSMENT OF SYMPTOMS

- COPD Assessment Test (CAT): an 8- item measure of health status impairment.
- Clinical COPD Questionnaire (CCQ): Self- administered questionnaire developed to measure clinical control in patient in COPD.
- Breathlessness Measurement using the Modified Medical Research Council (mMRC) Questionaire: relates well to other measures of health status and predicts future mortality risk.

Modified MRC (mMRC)Questionnaire

PLEASE TICK IN THE BOX THAT APPLIES TO YOU
(ONE BOX ONLY)

mMRC Grade 0. I only get breathless with strenuous exercise. ☐

mMRC Grade 1. I get short of breath when hurrying on the level or walking up a slight hill. ☐

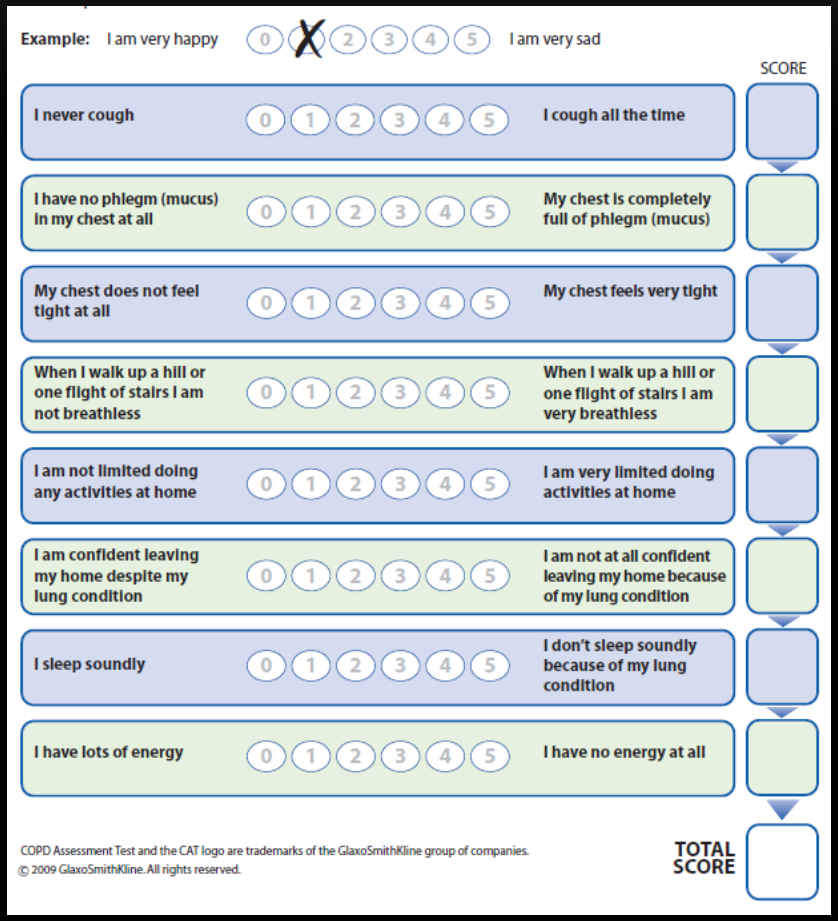
mMRC Grade 2. I walk slower than people of the same age on the level because of breathlessness, or I have to stop for breath when walking on my own pace on the level. ☐ ★

mMRC Grade 3. I stop for breath after walking about 100 meters or after a few minutes on the level. ☐

mMRC Grade 4. I am too breathless to leave the house or I am breathless when dressing or undressing. ☐

COPD Assessment Test (CAT)

- Patients read the two statements for each item, and decide where on the scale they fit
- Scores for each of the 8 items are summed to give single, final score (minimum 0, maximum 40)
- This is a measure of the overall impact of a patient's condition on their life



Example:	I am very happy	0 X 2 3 4 5	I am very sad	
				SCORE
I never cough		0 1 2 3 4 5	I cough all the time	
I have no phlegm (mucus) in my chest at all		0 1 2 3 4 5	My chest is completely full of phlegm (mucus)	
My chest does not feel tight at all		0 1 2 3 4 5	My chest feels very tight	
When I walk up a hill or one flight of stairs I am not breathless		0 1 2 3 4 5	When I walk up a hill or one flight of stairs I am very breathless	
I am not limited doing any activities at home		0 1 2 3 4 5	I am very limited doing activities at home	
I am confident leaving my home despite my lung condition		0 1 2 3 4 5	I am not at all confident leaving my home because of my lung condition	
I sleep soundly		0 1 2 3 4 5	I don't sleep soundly because of my lung condition	
I have lots of energy		0 1 2 3 4 5	I have no energy at all	
				TOTAL SCORE

Severity of Airflow Limitation
Severity of COPD

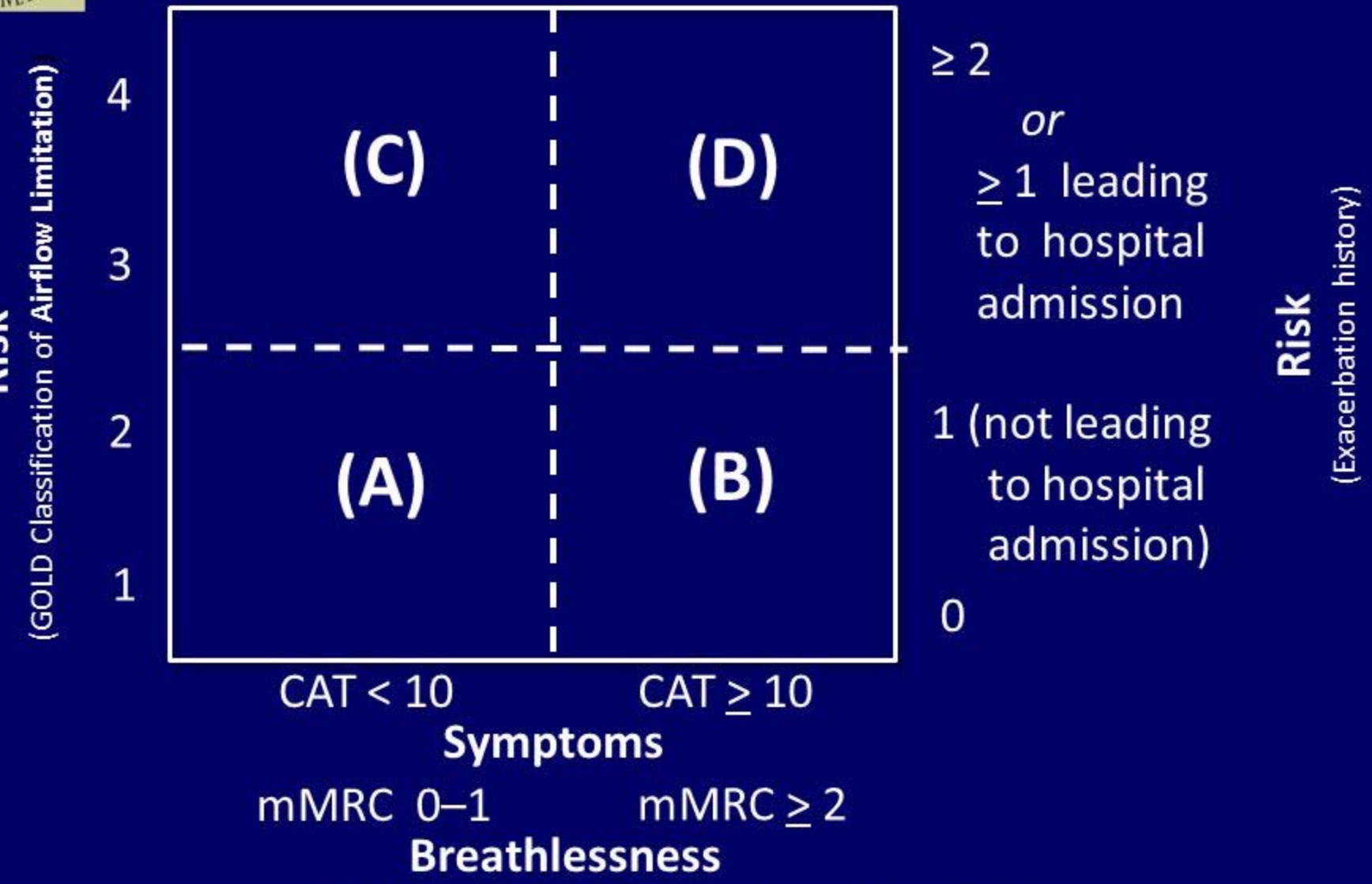
In patients with $FEV_1/FVC < 0.70$:

Mild	$FEV_1 \geq 80\%$ predicted
Moderate	$50\% \leq FEV_1 < 80\%$ predicted
Severe	$30\% \leq FEV_1 < 50\%$ predicted
Very Severe	$FEV_1 < 30\%$ predicted

**Based on Post-Bronchodilator FEV_1*

Global Strategy for Diagnosis, Management and Prevention of COPD

Combined Assessment of COPD



- A 56-year-old female with COPD describes dyspnea when hurrying on level ground. Post- bronchodilator FEV1 is 45% predicted with no history of exacerbations within the past year. What is the GOLD combined assessment of this patient?
- A. GOLD Risk Category A
- B. GOLD Risk Category B
- C. GOLD Risk Category C ✓
- D. GOLD Risk Category D

Patient category C High risk few symptoms GOLD Exacerbations or ≥ 1 admission CAT score mMRC	 3–4 ≥2/year <10 0–1
Patient category D High risk many symptoms GOLD Exacerbations or ≥1 admission CAT score mMRC	 3–4 ≥2/year ≥10 ≥2
Patient category A Low risk few symptoms GOLD Exacerbations CAT score mMRC	 1–2 ≤1/year <10 0–1
Patient category B Low risk many symptoms GOLD Exacerbations CAT score mMRC	 1–2 ≤1/year ≥10 ≥2

A 62-year-old woman is evaluated in the hospital after being admitted 4 days ago for an acute exacerbation of COPD. She has responded well to treatment and is ready to be discharged today. Her medical history is notable for moderate-severity COPD, heart failure, depression, osteoporosis, hypertension, and hyperlipidemia. Her discharge medications are coreg, simvistatin, sertaraline, tiotropium, levofloxacin, prednisone, and albuterol.

PE: BP 120/84, HR 80, RR 18. O2 sat 93% on RA. No JVD. Pulmonary examination reveals a few scattered wheezes and a few basal crackles. She is not using accessory muscles of breathing. Trace pedal edema is noted. She ambulates well without oxygen.

- Which of the following factors increases the patient ‘s risk for early hospitalization readmission for COPD?
- A. Adequate of discharge medication for COPD
- B. Female gender
- C. Length of hospitalization
- D. Multiple comorbid conditions ✓

INCREASE RISK OF READMISSION

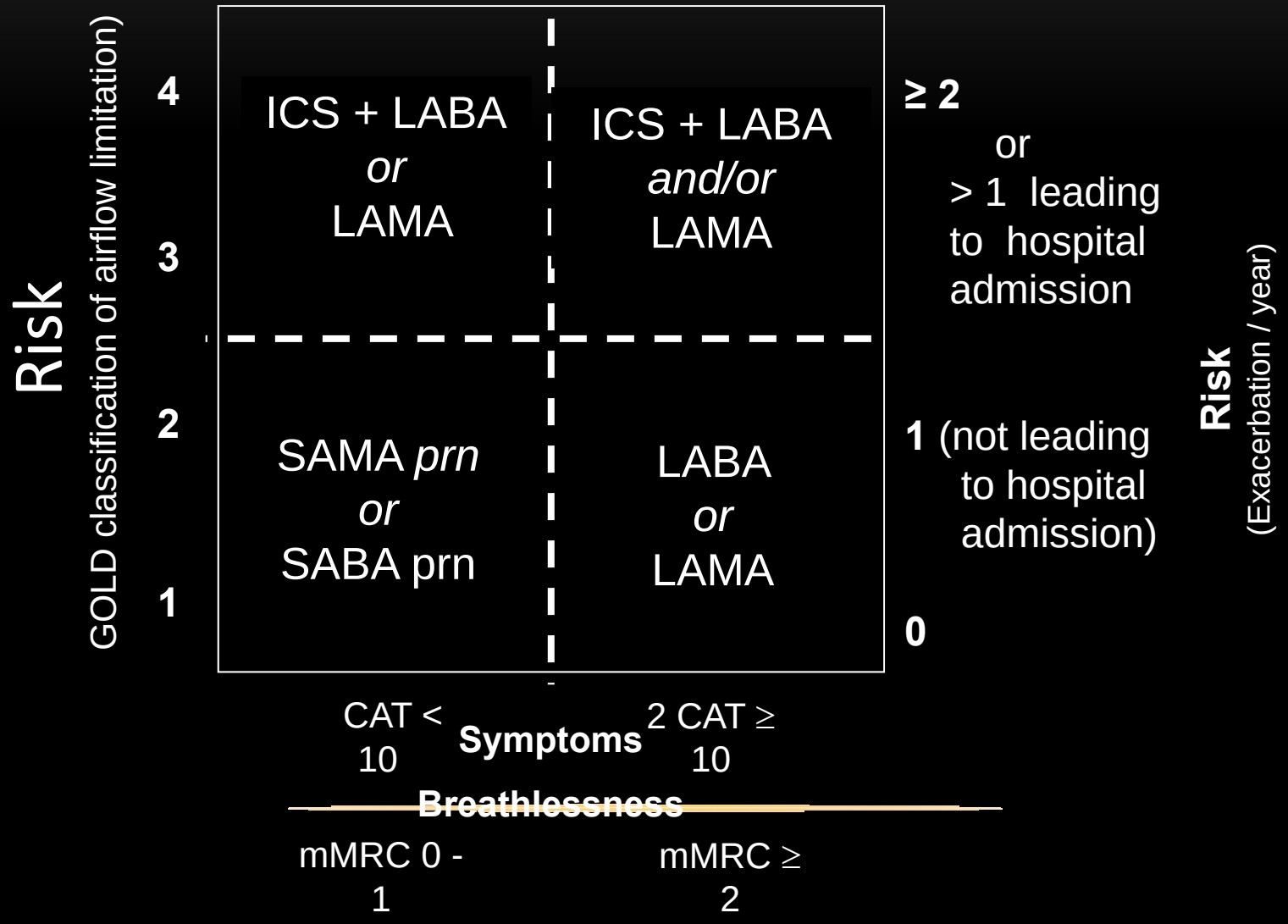
- Comorbidities increase risk of readmission
  - Cardiovascular Disease and heart failure
  - Osteoporosis, anxiety/depression
  - Lung Cancer
  - Metabolic Syndrome and DM
- Inadequate discharge medication for COPD Exacerbation
  - SABA, oral steroid, and antibiotic
- Length Hospitalization <2days or >5 days
- Male gender

- A 58-year-old man is evaluated for chronic cough, occasional wheezing, and shortness of breath associated with frequent stops to catch his breath when walking one to two blocks on level ground. His medical history is notable for an episode of bronchitis, for which he underwent outpatient treatment 6 months ago. He is a current smoker with a 30-pack-year smoking history.
- On physical examination, vital signs are normal. Examination of the lungs shows mildly decreased breath sounds throughout both lung fields and occasional scattered expiratory wheezes. The remainder of the physical examination is normal. Spirometry shows an FEV1 of 70% of predicted and a postbronchodilator FEV1/FVC ratio of 62%. His modified Medical Research Council (mMRC) symptom score is 2.

IN ADDITION TO SMOKING CESSATION, WHICH OF THE FOLLOWING IS THE MOST APPROPRIATE TREATMENT?

- A. Combination of steroid and LABA
- B. Roflimulast (PD-4 Inh) + ICS + LABA
- C. SABA PRN + LABA + Pulm Rehab ✓
- D. SABA PRN + ICS

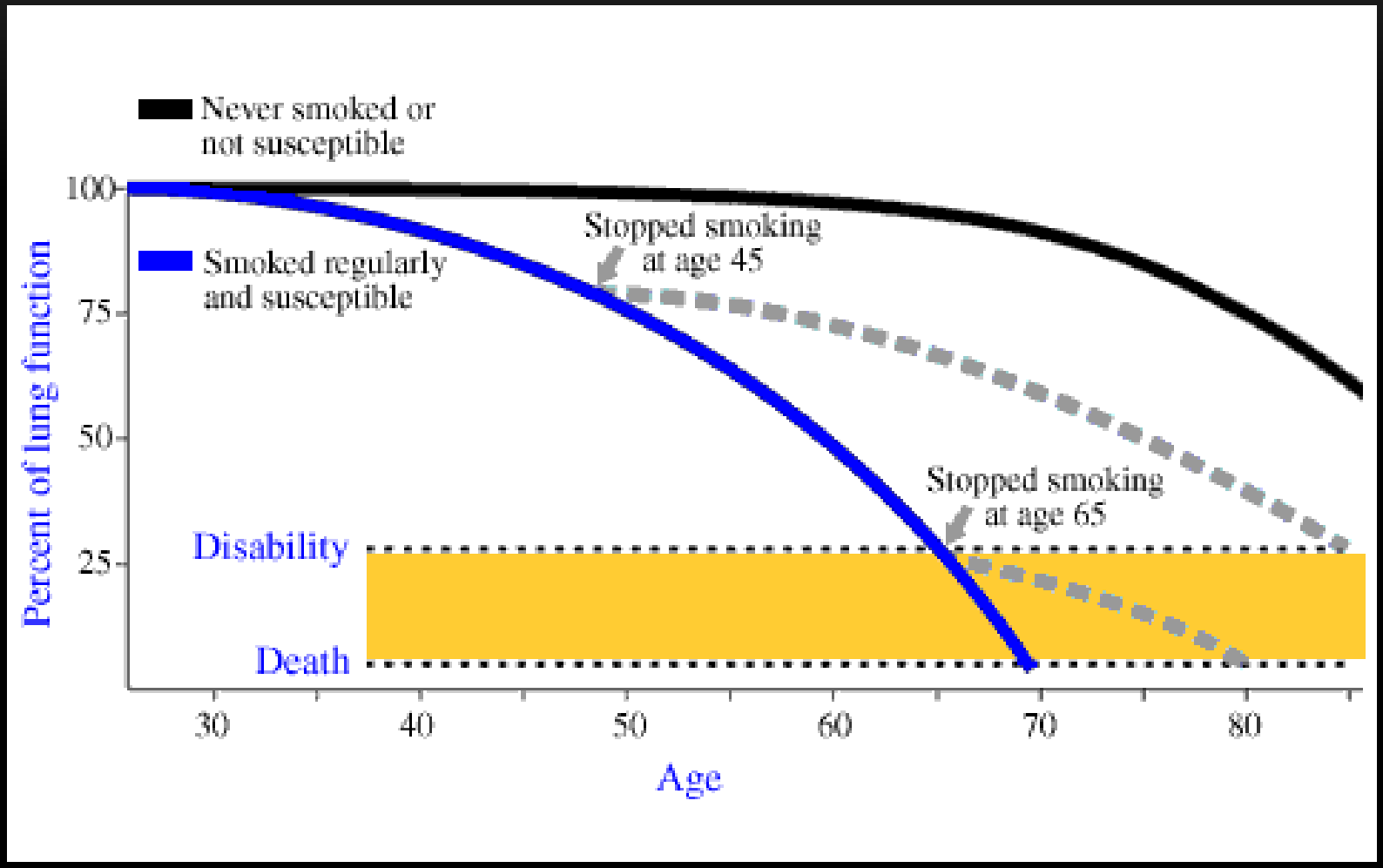
Combined Assessment of COPD



What therapy has been shown to slow the rate of FEV1 decline?

A. LABA
B. LAMA
C. Smoking Cessation ✓
D. LAMA + LABA/ICS
E. LAMA + LABA

STOP SMOKING!



Therapeutic Options: COPD Medications

SABA: Short-acting Beta- Agonist	**Albuterol and Levabuterol**
LABA: Long – acting B2 agonist	Salmeterol, Formoterol, Vilanterol, and Olodanterol
LAMA: long- acting muscarinic antagonist	Tiotropium (Spiriva), Aclidinium, & Umeclidinium
ICS: Inhaled Corticosteroid Budesonide pregnancy: class B	Beclomethasone (QVAR), Budesonide (Pulmicort), Fluticasone (Flovent), Momentasone (Asmanex)
Combinations: ICS + LABA	Budesonide & Formoterol (Symbicort), Fluticasone & Salmeterol (Advair), Momentasone & Formoterol (Dulera)
MABA: Muscarinic antagonist and beta agonist LAMA+LABA	Anoro (umeclidinium & vilanterol)

B2 Agonist	**Monotherapy (Expensive/BID)**
ICS	Increase mortality COPD (TORCH TRIAL) Osteoporosis/Pneumonia Combined LABA or LAMA
LAMA	Tiotropium (UPLIFT Trial): decrease AECOPD and mortality. No change FEV1
Pulmonary Rehab	Any stage COPD especially FEV1<50%
Steroid	Treatment for AECOPD Not recommended for chronic treatment
Advance therapy	Roflumilast oral, PDE-4

- A 64 year old man is evaluated following discharge from the hospital 1 week ago after an acute exacerbation of COPD. He completed a course of antibiotics in the hospital. He has severe COPD with chronic bronchitis with multiple exacerbations over the past few years. He completed pulmonary rehab 2 months ago and quit smoking two years ago.
- Meds: Symbicort/Spiriva/rescue inhaler and steroid taper.
- PE: VSS. Lung: scattered wheezing. O2 sat 93% on ambiet. FEV1 35% of predicted and FEV1/FVC= 56%.

In addition to his current COPD therapies which of the following is the most appropriate next step in treatment?

- A. Long term oral corticosteroids
- Long term oxygen therapy
- Oral N acetylcysteine
- Roflimulast ✓
- Theophylline

PHOSPHODIESTERASE-4 INHIBITOR

- Roflumilast
  - Benefit in Severe and Very Severe COPD (GOLD 3 and 4; FEV<50%) and a history of exacerbation and chronic bronchitis.
  - Reduces exacerbations treated with oral steroids.

- A 59-year-old woman is evaluated in follow-up in November after being diagnosed with moderate COPD 3 months ago. She has never received the influenza or pneumococcal vaccine. She has no allergies. Her medications are a long-acting inhaled anticholinergic agent and an as-needed short-acting β agonist.
- On physical examination, vital signs and the remainder of the physical examination are normal.

Which of the following vaccination are recommended for this patient?

- A. Inactivated influenza vaccine and PCV13
- B. Inactivated influenza vaccine and PPSV23 ✓
- C. Inactivated influenza vaccine, PPSV23, and PCV13
- D. Live Attenuated Influenza and PPSV23

OXYGEN

Improves survival!

- Oxygen therapy: The long-term administration of oxygen (>15 hrs per day) to pt with chronic respiratory failure has been to shown to increase survival in patient with severe, resting hypoxemia.

  1) PaO2<55 or O2 sat<88% on RA +/- hypercapnia

  2) O2 sat 89% on RA plus one of the following:

     - Pulmonary HTN
     - Peripheral edema suggestive of RHF
     - Polycethemia

- 66 year old male evaluated in the ICU for possible extubation. He was admitted 3 days ago after severe COPD exacerbation and intubated due to worsening hypercapnia after failing a trial of NIPPV. He was improved significant with treatment of solumederol, duonebs, and levaquin.
- PE: VSS/afebrile. Diminished BS b/l without wheezing. Small amount of secretions noted upon suctioning.
- He is off sedation and tolerating a PST. RT hands you blood gas 7.36/55/70 on PS FiO2=.35. You give an order to extubate the patient.

Which of the following interventions will decrease the patient risk of re-intubation?

- A. Incentive spirometry/flutter valve q 2hrs
- B. Inhaled helium oxygen mixture
- C. Nebulized acetylcysteine
- D. Non invasive positive pressure ventilation ✓
- E. High flow nasal cannula

- A 55-year-old man is evaluated in follow-up for severe COPD, which was diagnosed 2 years ago. He has had two exacerbations in the past year requiring hospitalization, and his baseline exercise tolerance is low. He completed pulmonary rehabilitation 3 months ago without much improvement in exercise capacity. He quit smoking 1 year ago. His medications are tiotropium, fluticasone/salmeterol, daily roflumilast, and albuterol as needed.

- PE:, vital signs are normal; BMI is 22. Oxygen saturation is 92% breathing ambient air. Scattered wheezing is noted bilaterally.

- Chest radiograph and CT scan both show emphysematous changes in the upper lobes. Spirometry shows an FEV 41 of 40% of predicted and a DLCO of 25% of predicted. His 6-minute walking distance is 240 meters (787 feet), consistent with decreased exercise tolerance.

Which of the following is the most likely to benefit this patient?

- A. Change fluticasone/salmetrol to fluticasone/vilanterol
- B. Daily prednisone
- C. Lung Transplant
- D. Lung Volume reduction surgery ✓

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MAY 22, 2003 VOL. 348 NO. 21

A Randomized Trial Comparing Lung-Volume–Reduction Surgery with Medical Therapy for Severe Emphysema

National Emphysema Treatment Trial Research Group*

- NOT: FEV1 of <20% & DLCO<20% or homogenous emphysema on CT.
- PA systolic >45, PA mean>35
- PaO2<45 on RA, PaCo2>60
- EF<45%
- Sig CAD, Obesity, uncontrolled HTN
- Clinically sig bronchiectasis.

MANAGE STABLE COPD: GOALS OF THERAPY

- Relieve symptoms
- Improve exercise tolerance
- Improve health status

Reduce symptoms

- Prevent disease progression
- Prevent and treat exacerbations
- Reduce mortality

Reduce risk

- A 66 year old male is evaluated for follow up for COPD; diagnosed last week with spirometry. FEV=58% predicted. He has a morning cough which is productive and dyspnea with moderate exertion. He quit smoking at the time of diagnosis. His only medication is a nicotine patch. He is started on short acting bronchodilator and is given appropriate vaccinations.

Which of the following is the most appropriate management?

- A. Budenoside inhaler
- B. Montelukast
- C. Oral prednisone
- D. Tiotroprium inhaler ✓
- E. Theophylline

PULMONARY REHABILITATION

Pulmonary rehabilitation benefits all patients with COPD particularly those with severe to very severe COPD or an MRC breathlessness score of 3 or more.

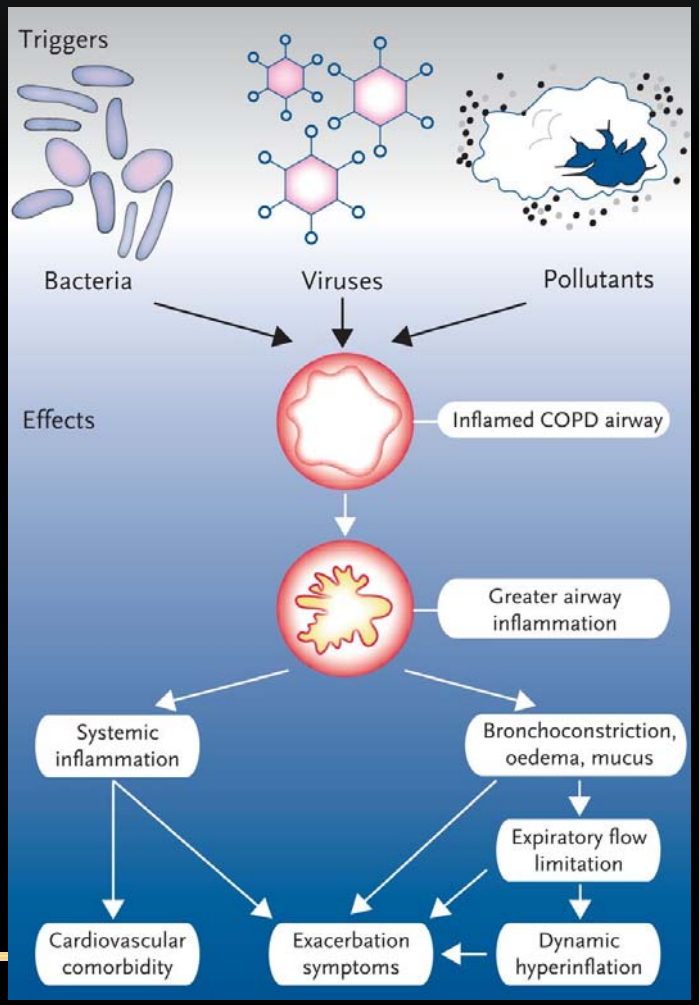
All patients with repeated exacerbations or who are admitted to hospital with an exacerbation should be fast tracked for pulmonary rehabilitation.

Pulmonary rehabilitation:

- improves exercise tolerance
- improves the quality of life
- reduces symptoms
- reduces the number of exacerbations
- reduces hospital admissions

ACUTE EXACERBATION OF COPD

- Defined: 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 medications.



MANAGE EXACERBATIONS: KEY POINTS

- Assessment: ABG, CXR, EKG, CBC, BNP, Purulent sputum, no PFT!
- Treatment:
  - SABA + LAMA SVN vs MDI (no difference)
  - Systemic steroid: prednisone 40mg x 5 days vs high dose IV (no difference)
- Oxygen: goal spaO2 88-92%
- *Antibiotics* should be given to patients with:
  - Three cardinal symptoms: increased dyspnea, increased sputum volume, and increased sputum purulence.
  - Two cardinal symptoms if one of which is increased sputum purulence.

INDICATION FOR HOSPITAL ADMISSION

- Marked increased intensity of symptoms
- Severe underlying COPD
- Onset of new physical signs
- Failure of an exacerbation to respond to initial medical mgt
- Presence of serious comorbidities
- Frequent exacerbation
- Older age
- Insufficient home support

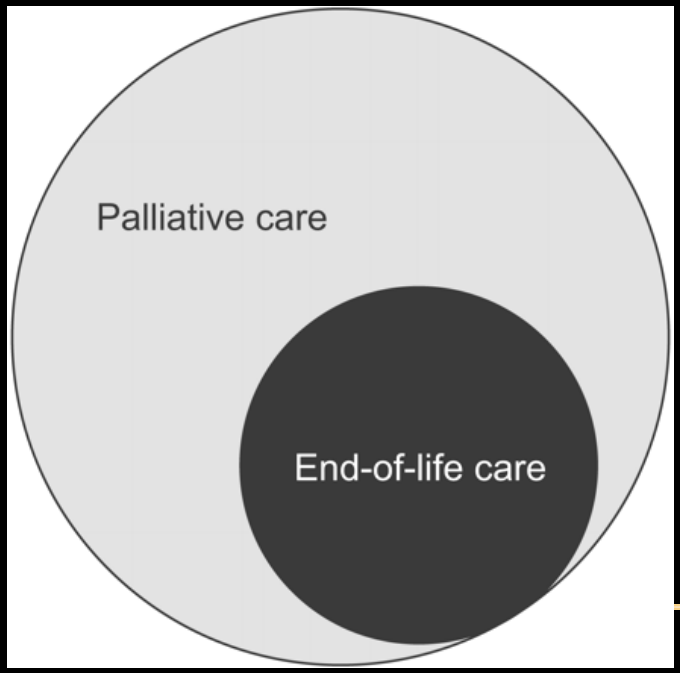
- A 60 year old male is evaluated prior to elective hernia repair that is schedule for next week. He has a moderate COPD and has an increase in cough/green sputum production/dyspnea over past 3 days. His last exacerbation was 6 months ago and he quit smoking at that time. Meds: Spiriva and rescue inhaler which he is using 4 times a daily.
- PE: T=99 BP 128/74 HR 99 RR 20 O2 sat 92% on RA. Bilateral exp wheezing.
- FEV1=55% of predicted and an FEV1/FVC=60%

In addition to treating the exacerbation of his COPD; which of the following is the most appropriate next step management?

- A. Piss of the surgeon and delay the surgery ✓
- B. Repeat PFT ASAP!
- C. Start roflumilast
- D. No further intervention
- E. Overnight sleep study

PALLIATIVE CARE

- Palliatve Care, End-of-life care, Hospice Care:
  - Communication with advanced COPD patients about end-of-life care and advanced care planning.



COPD CLINICAL PEARLS

- Yearly CXR, smoker's asymptomatic no PFTs (15-20% 1ppd develop COPD)
- 60% of emphysema Pts have Normal CXR. If symptoms do PFTs
- All pt with FEV1<40% should have ABG to R/O CO2 retention.
- HCO3 increased by 4 for every 10mmHg elevation in pCO2 above 40.
- Chronic CO2 retainer: C/I Narcotics, Sedatives, Melatonin, BZDs
- NPPV: COPD PaCO2> 45 or pH <7.30 & Pulm Edema due to CHF
- Not all wheezing is from "COPD"

REFERENCES

- Global Initiative for Chronic Obstructive Lung Diesease – 2015
- Update
- ATS Pulmonary Review Book
- Respiratory Physiology with Dr. John B West