COPD

Definition: airflow limitation that is not fully reversible, is progressive, and is associated with an abnormal inflammatory lung response.

FACTS:

- COPD is incurable, and no current medication fully prevents the decline in lung function.
- It is the 4th leading cause of death in the U.S.
- Half of all COPD patients die within a decade of diagnosis.
- Exacerbations speed the decline in lung function that is characteristic of COPD.
- Approximately a quarter of COPD patients hospitalised with an exacerbation will die within one year.
- Almost one in six people admitted to hospital suffering from a severe exacerbation of COPD die during that admit. This mortality rate is higher than that seen among patients admitted with myocardial infarction.
- A typical exacerbation lasts 12 days and patients take on average a further 10 days to recover.
- Some patients never regain their baseline lung function.
- Three-quarters of patients with advanced COPD are unable to perform ‘everyday’ activities and show greater impairment in this respect than patients with lung cancer.

WHAT'S IT LIKE?

- Patients rank avoiding the trauma of exacerbations as being more important than ongoing symptomatic improvement.
- On average, a patient with COPD experiences one exacerbation every ten months, with 30% suffering at least three annually.
- Patients may report only half of the exacerbations they experience
- Increased breathlessness is the symptomatic hallmark of an exacerbation.
- Patients have reduced activities of daily living, with nearly 50% stopping all activities during exacerbations; 43% of these isolated themselves completely, while 34% avoided going outdoors.
- 99% said that exacerbations affected their mood, causing depression and anger in 41% and 30% respectively.
- HRQoL [health-related quality of life] scores may predict outcomes more accurately than lung function tests; among people admitted to hospital with COPD, poorer HRQoL was associated with a 4.8 fold higher risk of readmission over the next year. Conversely, neither FEV1 nor FVC predicted the likelihood of readmission.
- Severe COPD has a greater impact on HRQoL and psychiatric health than lung cancer.
- Patients (on the internet) say:
  "I began to have spells when I couldn’t catch my breath while doing the simplest of activities. I thought I was out of shape and that's why I was out of breath."
  "When you have COPD, it's like breathing through a straw."
  "All I did was walk from the bedroom to the bathroom and sit down. I was planning on trying to take a shower. Instead I got a full blown attack of shortness of breath."
  "Sometimes anxiety can get high and you hyperventilate which causes more shortness of breath."
  "I felt like I had become my illness. I had no life of my own - merely a life of survival - racing from doctor to doctor only to confirm what I already knew: at age 54, I had end-stage COPD caused by more than 30 years of smoking. I suffered in silence, wondering how long I had to live. 3 years? 5 years? I didn’t know and was too afraid to ask."
  "Everyone asks, 'Why can't you sing anymore? Why don't you have any energy? Why can't you climb steps? Why are you inside on such a beautiful day?'"
  "I hate the disease and mourn what I have lost because of it."

DIAGNOSING COPD

- Cough is the first symptom. Patients often consider cough to be part of growing old or a side effect of smoking, and ignore it.
- COPD patients usually consult their doctor because of dyspnea, a later symptom in disease progression.
- COPD should be considered in any patient with chronic cough, sputum or dyspnea, especially if they smoke.
- Approximately 50% of smokers may develop COPD.

SPIROMETRY:
Only about half of primary care physicians use spirometry to diagnose COPD; only about one-third know the GOLD stages.
FEV1/FVC<70% with post-bronchodilator FEV1<80% predicted confirms "poorly reversible airflow limitation."
In FEV1<40% predicted, or with signs/symptoms of respiratory failure or right heart failure, get blood gases.
Note: the U.S. Preventive Services Task Force does not recommend screening asymptomatic patients using spirometry.

CXR:
COPD is not found by chest x-ray unless features of emphysema are present.

CRP:
High C-reactive protein (>3) indicates systemic inflammation, with a higher resting energy expenditure & worse cardiovascular status. This is related to chronic hypoxic systemic effects - inflammation triggered by hypoxia. Hypoxic inducibility of gene products may be linked to heritability of inflammatory airway disease.

STAGING

GOLD [Global Initiative for Chronic Obstructive Lung Disease] staging via spirometry:

I	Mild, FEV1 $\geq$ 80% predicted.
II	Moderate, FEV1 $\leq$ 80% predicted.
III	Severe, FEV1 $\leq$50% predicted.
IV	Very severe, FEV1 $\leq$ 30% predicted, OR $\leq$ 50% predicted PLUS chronic respiratory failure.

OUTPATIENT PRIMARY CARE

1. Smoking cessation: the only thing that has been shown to alter the long-term prognosis.
Give nicotine patches + antidepressants to reduce withdrawal symptoms.
Counseling significantly improves cessation rates, even brief, three-minute counseling.

2. Vaccination: halves the risk of "serious" illness and death in COPD patients. Give flu and pneumovax shots.

3. Reduce air trapping with bronchodilation.
Air trapping is a primary cause of breathlessness, and restricts a patient's ability to perform daily activities.
Long-acting beta-agonists and long-acting anticholinergics improve lung function, exercise capacity, dyspnea and HRQoL, and, on average, demonstrate a 21% reduction in COPD exacerbations.

4. Reduce inflammation with inhaled steroids.
These reduce the exacerbation rate by 24%; and by 48% when combined with long acting beta-agonists. They reduce the progression of emphysema by up to 50% in smokers. They also reduce cardiac ischemic events.
Fluticasone + salmeterol = most well-studied.

5. Pulmonary rehabilitation = exercise training (respiratory muscle use, e.g. pursed lip breathing, abd breathing), nutrition counseling, and disease education. Can be provided in day programs, in the home, and even followed over the phone by RNs.

6. Supplemental oxygen for Stage IV (very severe) COPD.

7. Patients with upper lobe emphysema might benefit from lung reduction surgery.

8. No mucolytics, e.g. mucomyst and guaifenesin - they don't help.

EXACERBATIONS

GOLD advises hospital assessment or admission if patients show any of the following symptoms or signs:

- The patient is aged 70 years or over.
- The patient has a marked increase in symptom intensity: for example, the patient suddenly develops resting dyspnea, cyanosis or peripheral edema.
- The exacerbation does not respond to outpatient medical management.
- The patient suffers from significant comorbidities or newly occurring arrhythmias.
- There is insufficient home support to treat at home.

INITIAL EVALUATION:

- Pulse oximetry with $SaO2 < 88.5\%$ is specific for hypoxia - spirometry & measures of dyspnea are sensitive but not specific during exacerbation.
- Obtaining blood gases after inital treatment is useful to determine who needs noninvasive positive airway pressure (BiPAP) & who needs intubation.
- Caution: In studies, most patients say they did not give consent for an arterial stick, the stick was very painful, and they weren't told it could change their treatment. Topical anesthetic (eg, Emla) is insufficient to reduce the pain of an arterial stick.
- Venous blood gases should be used as a screen for who needs more precise arterial blood gases (found to reduce need for arterial sticks by 30%). Patients with venous $CO2 > 45mmHg$ can get an arterial stick to determine degree of hypercarbia. Additionally, arterial pH can be estimated as 1.004 x (venous pH). (pO2 is poorly correlated between arterial and venous samples.)

ANTIBIOTICS:

- Presume an infectious cause of the exacerbation when the patient exhibits breathlessness, cough, and increased purulence/volume of sputum.
- 80% of exacerbations are thought to be infectious.
- Causative organisms are approximately equally distributed among bacteria, viruses, and mixed [bacteria + viruses].
- Atypical bacteria [Chlamydia pneumoniae, Mycoplasma pneumoniae] are usually colonizers of COPD airways, and show up in sputum cultures without directly causing exacerbations.
- Rhinovirus & respiratory syncytial virus (RSV) are the primary causative viruses.
- Bacterial infections are usually Hemophilus influenzae, Moraxella catarrhalis, and/or S. pneumoniae (always ask if patient is vaccinated against S. pneumo).

CHOICE OF ANTIBIOTICS, PER GOLD STANDARDS:
Uncomplicated exacerbation (age < 65, < 4 exacerbations in past year, no comorbidities, FEV1>50% predicted): azithromycin or clarithromycin; doxycycline; 2nd or 3rd generation cephalosporin; levofloxacin. (Note, high risk of azithromycin resistance in S. pneumo - is patient vaccinated?)
Complicated exacerbation (age > 65, > 4 exacerbations/year, comorbidities, or FEV1<50% predicted): levofloxacin, moxifloxacin, or ciprofloxacin (a.k.a. "respiratory quinolones"); high-dose augmentin.
Complicated exacerbation in a patient at high risk for pseudomonas (bronchiectasis, multiple courses antiobiotics &/or steroids, or FEV1<35% predicted): levofloxacin, moxifloxacin, or ciprofloxacin.

OXYGEN:
Wanted: SaO2 90-92%. Do not hyperventilate in a patient who chronically retains CO2. Use BiPAP early, to prevent respiratory muscle fatigue. This is found to reduce the need for intubation and to shorten length of hospital stay.

STEROIDS:
Give a 10-day course of 30 mg oral prednisone daily, if the exacerbation results in dyspnea severe enough to interfere with daily activities.
Give a 10-day course of 40 mg oral prednisone daily if baseline FEV1<50% predicted (Stage III or IV at baseline).
10 days with a long taper gives faster improvement than a 3-day burst of steroids.

BRONCHODILATION:
Use combination inhalers with an inhaled steroid and a long-lasting beta-agonist.

HOME-BASED PULMONARY REHAB:
Rehab sessions three times a week have been found to reduce depression and anxiety significantly.
Consider a phone call intervention every other day, to encourage increased home activity to a goal of activity three times daily at 75% maximum dyspnea.

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