A Primary Care Perspective on COPD

Learning Objectives
After participating in this educational activity, participants should be able to:

1. Utilize spirometry to diagnose and manage COPD
2. Advise and refer patients to exercise and pulmonary rehabilitation programs as a preventive measure
3. Match medications to the need of the COPD patient and be alert to potential side effects
4. Recognize the risk factors and signs of nonadherence and adjust care plans as needed to improve adherence
5. Engage adjunct professionals to help patients exercise and rehabilitate lung function

Pre-test Questions
1. Chronic obstructive pulmonary disease mortality, like heart disease, stroke, and cancer, has not increased in the United States (US).
a. True
b. False

2. Chronic obstructive pulmonary disease has an impact on the following disease states:
   a. Ischemic heart disease
   b. Heart failure
   c. Normocytic anemia
   d. Diabetes and metabolic syndrome
   e. Depression
   f. A, B, and E
   g. All of the above

Introduction
COPD (chronic obstructive pulmonary disease) is a common, preventable, and treatable disease characterized by persistent airflow limitation that is usually progressive. In this disease there is an enhanced chronic inflammatory response in the airways and lungs, to noxious particles, fumes, or gasses.[1]

Exacerbations are defined 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 medications. Severe exacerbations are defined as those that require a hospital stay, whereas a mild exacerbation can be treated with rescue medications and a moderate exacerbation can be treated with steroids as an outpatient. The goals of the treatment of COPD exacerbations are to minimize the impact of the current exacerbation and to prevent future ones.[1]

COPD is clearly a cause of morbidity and mortality and results in an ever-increasing economic and social burden.[1] In fact, this disease has become the third leading cause of death in the United States[2] as well as, the second leading cause of disability.[3]

While this is a disease of the lungs, COPD also produces significant systemic consequences.[4] Airflow limitation and hyperinflammation affect cardiac function and gas exchange. Inflammatory mediators, which are in circulation as a result of this disease, can contribute to cachexia and skeletal muscle wasting, and may either initiate or worsen important diseases such as ischemic heart disease, heart failure, osteoporosis, normocytic anemia, diabetes, metabolic syndrome, and depression.

Despite the fact that these statistics have been known for nearly a decade, of the nearly 24 million adults in the US exposed to this disease, approximately 50% are undiagnosed.[5] Even more alarming, a recent study has shown that 66% of patients with commercial insurance and 70% of Medicare patients receive no maintenance medication.[6]

This alarming situation has led to a variety of public initiatives in the US to increase the population’s understanding of this disease.
The World COPD Day of November 20th, 2013, was organized by GOLD (Global Initiative for Chronic Obstructive Lung Disease) with the theme of IT’S NOT TOO LATE. Events such as public service announcements, demonstrations of spirometry with free screening clinics, and other clinics and fairs have been coupled with sessions for physicians, nurses, and other health care professionals on the latest guidelines for COPD diagnosis and treatment.

The aim:
1. Reducing deaths from COPD
2. Reducing hospitalizations due to COPD
3. Reducing the number of new cases

NASCAR, as well, has led a joint campaign with official partner DRIVE 4 COPD to improve awareness and to encourage fans to get screened.

This activity will expand on the stated learning objectives to:
1. Understand how and when to screen for COPD and to be able to use those findings to assist in diagnosis and lead to evidence based decisions and management.
2. Expand on the importance of pulmonary rehabilitation and how it improves outcomes in COPD, and reduces hospitalizations and length of hospital stays.
3. Ensure practitioners understand how the new GOLD classes have incorporated the assessments of symptoms and risks in the classification of COPD patients, and placed treatment options in the appropriate new classes. The practitioner will learn if there is any superiority between the traditional and emerging therapies.
4. Be aware that persistence, compliance and adherence to COPD management programs are sub-optimal. Are there ways that these can be improved?

Primary Issues has recently published an excellent online CME “The Diagnosis and Management of COPD in the Primary Care Setting”. This activity follows a single typical case through a patient’s disease history and expands on the above objectives.

CASE: JUNE
June, a 65-year-old white female, presents to your office for the first time after moving across the country to be near her family. She admits to having COPD for “many years” and although she has made several attempts to quit, still admits to having a 40-year history of smoking half a pack of cigarettes per day. She has been diagnosed with hypertension and depression, both of which she states are controlled on medication.

Her current symptoms include shortness of breath, even while walking on level ground, and a feeling of “weakness” while doing normal activities. She does not feel rested in the mornings because of “poor sleep.”

She denies chest pain during rest or exertion, but admits to having a daily productive cough. Her sputum is yellowish tinged, amounting to about “several ounces” a day.
She states she was admitted to a hospital twice over the past twelve months for “bronchitis” with lengths of stays of approximately three days and was treated with oral steroids and antibiotics. A post-discharge sleep apnea test was negative. She cannot recall having a spirometric evaluation in the past several years.

Her physical exam revealed a white female who smelled of nicotine. Her blood pressure was 140/82, pulse 78 and regular, respiratory rate 20, and weight 60 kg. She was afebrile. She had audible expiratory wheezing on speaking, and chest examination revealed decreased air entry bilaterally with coarse ronchi, particularly in the bases. Her AO2 was 88% on arrival in the office with a reading of 92%, 20 minutes later. Her affect was somewhat flat, but there was no suicidal ideation. She looked older than her stated age, with poor muscle tone.

Medications included:
Fluticasone/Salmeterol 250/50 – one puff BID (2x per day)
Albuterol HFA – reported use 4 times a day
Lisinopril 10 mg po qd
Citalopram 20 mg po qd

3. Classification of this patient’s disease based on the above information is COPD:
   a. GOLD Stage 2
   b. GOLD Stage 3
   c. GOLD Class B
   d. GOLD Class C
   e. Unable to classify this patient

4. Initial investigations to confirm the diagnosis and severity of COPD would be:
   a. Pre bronchodilator FEV\textsubscript{1}/ FVC
   b. Post bronchodilator FEV\textsubscript{1}/ FVC
   c. Chest X-ray
   d. Assessment of exacerbation risk
   e. Assessment of symptoms by a CAT (COPD Assessment Test) or mMRC (Modified Medical Research Council Scale)
   f. B,D,E
   g. A,B,C,D

Let us consider the investigations necessary to assist in the diagnosis, assessment of severity, and the appropriate treatment.

We can consider the diagnosis of COPD in this patient because she has dyspnea, chronic cough, and sputum production with a history of exposure to risk factors. Spirometry is required to make the diagnosis. A post bronchodilator FEV\textsubscript{1}/ FVC ratio ≤ 0.7 confirms the presence of persistent airflow limitation and thus COPD.[1]

Spirometry is reproducible and the most objective measurement of airflow limitation. Physical examination, while important, is rarely diagnostic. Peak Flow measurement, while having good sensitivity has weak specificity. There is controversy about screening the general population because there is no evidence that there are improvements in
COPD outcomes which are identified before the patient develops significant symptoms. A general rule of thumb would be to order spirometry after considering the history, physical examination, and/or hospitalization record.

Spirometry for this disease should measure the FVC (forced vital capacity), the FEV₁ (the volume of air exhaled during the first second of testing), and the post bronchodilator FEV₁/FVC ratio. These measurements are evaluated by comparison with reference values and are thus done pre- and post-bronchodilation.

Important considerations in performing spirometry include the following:

A. A trained supervisor using regularly calibrated equipment
B. Spirometry should produce a hard or a digital copy and display
C. Maximal patient effort is important
D. The post bronchodilator study is done 10 – 15 minutes with 400 µg of a SABA (short-acting Beta agonist) or 30 – 45 minutes after a short-acting anticholinergic
E. The FEV₁/FVC should be the largest of any three technically satisfactory curves with optimally no irregularities and no coughing. These curves should not vary more than 5%

An often forgotten standard is that patients should not use their short-acting medications 6 hours before the test and long-acting bronchodilators 12 hours before the test.
Table 1. Shows a Normal Tracing[1]

Spirometry - Normal Trace

FEV₁ = 4L  
FVC = 5L  
FEV₁/FVC = 0.8

Time, seconds

Volume, liters
Table 2. Shows a Tracing Suggesting an Obstruction[1]

5. Current GOLD Guidelines state that the patient assessment of disease and treatment include:
   a. Measurement of airflow limitation
   b. Assessment of symptoms by validated patient questionnaires, such as the modified Medical Research Council Scale (mMRC) or the COPD Assessment Test (CAT)
   c. Exacerbation risk
   d. History of comorbidities
   e. All of the above

We have covered the use of spirometry to measure airflow limitation and the accepted values needed to diagnose COPD. The classification of severity of airflow limitation in COPD, based on the post-bronchodilation value of FEV$_1$ is as in Table 3.
Table 3. Classification of Severity of Airflow Limitation in COPD[1]

<table>
<thead>
<tr>
<th>Stage</th>
<th>Criteria*</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD 1: Mild</td>
<td>FEV&lt;sub&gt;1&lt;/sub&gt;/FVC &lt;0.70; FEV&lt;sub&gt;1&lt;/sub&gt; ≥80% predicted</td>
</tr>
<tr>
<td>GOLD 2: Moderate</td>
<td>FEV&lt;sub&gt;1&lt;/sub&gt;/FVC &lt;0.70; 50% ≤FEV&lt;sub&gt;1&lt;/sub&gt; &lt;80% predicted</td>
</tr>
<tr>
<td>GOLD 3: Severe</td>
<td>FEV&lt;sub&gt;1&lt;/sub&gt;/FVC &lt;0.70; 30% ≤FEV&lt;sub&gt;1&lt;/sub&gt; &lt;50% predicted</td>
</tr>
<tr>
<td>GOLD 4: Very Severe</td>
<td>FEV&lt;sub&gt;1&lt;/sub&gt; &lt;30% predicted</td>
</tr>
</tbody>
</table>

*post bronchodilator values

Symptoms can be assessed by:

A. The mMRC as shown in Table 4. This test relates well to other measures of health status.[7]

Table 4. Modified Medical Research Council Questionnaire for Assessing the Severity of Breathlessness[7,8]

<table>
<thead>
<tr>
<th>PLEASE CHECK THE BOX THAT APPLIES TO YOU (ONE BOX ONLY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mMRC Grade 0 I only get breathless with strenuous exercise</td>
</tr>
<tr>
<td>mMRC Grade 1 I get short of breath when hurrying on level ground or walking up a slight hill</td>
</tr>
<tr>
<td>mMRC Grade 2 On level ground, I walk slower than people of the same age because of breathlessness, or I have to stop for breath when walking at my own pace on the level</td>
</tr>
<tr>
<td>mMRC Grade 3 I stop for breath after walking about 100 yards or after a few minutes on level ground</td>
</tr>
<tr>
<td>mMRC Grade 4 I am too breathless to leave the house or I am breathless when dressing</td>
</tr>
</tbody>
</table>

B. The CAT in Table 5 measures health status improvement in COPD and is reliable and responsive.[9]
# Table 5. COPD Assessment Test (CAT)

## How is your COPD? Take the COPD Assessment Test™ (CAT)

This questionnaire will help you and your healthcare professional measure the impact COPD (Chronic Obstructive Pulmonary Disease) is having on your wellbeing and daily life. Your answers, and test score, can be used by you and your healthcare professional to help improve the management of your COPD and get the greatest benefit from treatment.

For each item below, place a mark (X) in the box that best describes you currently. Be sure to only select one response for each question.

**Example:** I am very happy **X** 2 3 4 5 I am very sad

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I never cough</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>I have no phlegm (mucus) in my chest at all</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>My chest does not feel tight at all</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>When I walk up a hill or one flight of stairs I am not breathless</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>I am not limited doing any activities at home</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>I am confident leaving my home despite my lung condition</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>I sleep soundly</td>
<td>0 1 2 3 4 5</td>
</tr>
<tr>
<td>I have lots of energy</td>
<td>0 1 2 3 4 5</td>
</tr>
</tbody>
</table>

COPD Assessment Test and the CAT logo is a trade mark of the GlaxoSmithKline group of companies. © 2003 GlaxoSmithKline group of companies. All rights reserved.

Last Updated: February 24, 2012
6. The understanding of the impact of COPD on an individual combines the assessment of symptoms, the patient’s spirometric classification, and the risk of exacerbations.
   a. True
   b. False

7. The combined COPD assessment for June would be:
   a. Group A
   b. Group B
   c. Group C
   d. Group D

The association of symptoms, spirometric classification, and the future risk of exacerbations can be seen in Table 6.
Table 6. GOLD Assessment of COPD[1]

Risk assessment is determined by symptoms, spirometric classification and future risk of exacerbations. One or more hospitalizations for COPD exacerbations should be considered high risk.

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>mMRC or CAT score</th>
<th>Spirometric Classification</th>
<th>CAT</th>
<th>Exacerbations/year</th>
<th>mMRC Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Low risk Less Symptoms</td>
<td>GOLD 1-2</td>
<td>&lt; 10</td>
<td>≤ 1</td>
<td>0-1</td>
</tr>
<tr>
<td>B</td>
<td>Low Risk More Symptoms</td>
<td>GOLD 1-2</td>
<td>≥ 10</td>
<td>≤ 1</td>
<td>≥ 2</td>
</tr>
<tr>
<td>C</td>
<td>High Risk Less Symptoms</td>
<td>GOLD 3-4</td>
<td>&lt; 10</td>
<td>≥ 2</td>
<td>0-1</td>
</tr>
<tr>
<td>D</td>
<td>High Risk More symptoms</td>
<td>GOLD 3-4</td>
<td>≥ 10</td>
<td>≥ 2</td>
<td>≥ 2</td>
</tr>
</tbody>
</table>

These Groups can be summarized as follows:

A. Low risk/less symptoms
   Typically GOLD I or II (Mild or Moderate airflow limitation) and/or 0-1 exacerbation/year and mMRC grade 0-1 or CAT score <10

B. Low risk/more symptoms
   Typically GOLD I or II (Mild or Moderate airflow limitation) and/or 0-1 exacerbations/year and mMRC grade ≥ 2 or CAT score ≥ 10

C. High risk/less symptoms
   Typically GOLD III or IV (Severe or Very Severe airflow limitation) and/or ≥ 2 exacerbations/year and mMRC grade 0-1 or CAT score <10

D. High risk/more symptoms
   Typically GOLD III or IV (Severe or Very Severe airflow limitation) and/or ≥ 2 exacerbations/year and mMRC grade ≥ 2 or CAT score ≥10

If there is a discrepancy in these classification components, the patient should be assigned to the higher group. Generally in primary care, patients are rarely seen in Group A, but commonly in Group B and C, and less commonly in Group D.

Patients in GOLD categories III and IV may be at greater risk of hospital admission and/or death.[1]

Using this approach, we can understand the complexity of COPD better than using a single measure such as analysis of airflow limitation. Additionally, oximetry should be used to assess all stable patients with a FEV1 ≤ 35% of predicted. Chest x-rays are not useful to
establish a diagnosis, but are helpful in establishing the presence of significant comorbidities.

**Let us return to our patient, June:**

In this particular case spirometry was ordered and produced the following results:

- Post bronchodilator FVC 64%
- Post bronchodilator FEV\(_1\) 28%
- Post bronchodilator FEV\(_1\)/FVC 0.31

We would therefore classify her as Gold IV, very severe. Pulse oximetry result in a stable assessment was 88%, and mMRC score was calculated Grade 2 by her history. She reports two exacerbations in the previous year.

This patient’s category is patient Group D, i.e., high risk with significant symptoms requiring an aggressive medication, education, and rehabilitative approach. The aim is to reduce symptoms and reduce risk. On a recall to the office, her practitioner reviewed the current GOLD guidelines to determine her regimen and recommended the following:

1. Smoking cessation, being the intervention with the greatest capacity to influence COPD outcomes was aggressively pursued. She was enrolled in a smoking cessation program, as she expressed a strong desire to quit. She did not wish to use medication.
2. Patient was prescribed oxygen therapy at 2 liters/minute because of her decreased O\(_2\) saturation, even at stable conditions.
3. GOLD guidelines were used to establish appropriate medication.

These guidelines recommend as first choice:

- Group A: Short-acting bronchodilator (SABA) or short-acting muscarinic (SAMA)
- Group B: Long-acting muscarinic (LAMA) or long-acting bronchodilator (LABA)
- Group C: LAMA or ICS (inhaled corticosteroid)/LABA combination
- Group D: LAMA and ICS/LABA combination

The various and many medications available are well described in the guidelines. There is no evidence to suggest one class of bronchodilators over another for initial treatment, but for some patients, combinations are appropriate. For any individual patient, the choice should include the patient’s perception of symptom relief. For the most severe patient, in Group D, as is this patient, there is good evidence for a triple therapy, and given the patient’s history of two exacerbations in the previous year, the addition of a phosphodiesterase-4 inhibitor (PDE4) if the patient has chronic bronchitis is also appropriate. Her inhaler technique was reviewed and found to be acceptable.

In this case, it was decided to add a PDE4 inhibitor to her ICS/LABA because of her high risk of exacerbations. An alternative and equally reasonable choice would be to add a LAMA to her ICS/LABA, although this combination may have less effect on future exacerbations.
8. Pulmonary rehabilitation does the following in COPD:
   a. Improves exercise capacity
   b. Reduces hospitalizations and lengths of stay
   c. Improves health related quality of life
   d. Improves survival
   e. Enhances effects of long-acting bronchodilators
   f. A, B, C
   g. A, B, C, D, E

The principal goals of pulmonary rehabilitation are to reduce symptoms, increase physical and emotional participation in every day life, and improve the quality of life. A large number of clinical trials show an increase in peak workload, peak O₂ consumption, and endurance time. Pulmonary rehab can reduce hospital visits and length of stay, improve the efficacy of long-acting bronchodilators, and even improve survival.[1] A good program should last a minimum of 6 weeks, but the longer the program continues, the more effective the results.[10]

The components of pulmonary rehab vary widely, but include exercise therapy, smoking cessation, nutritional counseling, and education. The following points are salient.

Exercise training ranges from daily to weekly, from 10-45 minutes per session. The length depends on the resources available and ranges from 4-10 weeks, with longer programs having better results. Endurance exercise training to 60-80% of the symptom-limited maximum is preferred. This can be accomplished through continuous or interval exercise programs. In severely disabled patients, a simple wheeled walking device improves walking distance and reduces breathlessness. Appropriate muscle training provides additional benefits.

Benefits are seen with a wide range of disability.

Highly motivated patients do better than those less motivated.

It is very important to receive education in smoking cessation, improvement in self-management skills, strategies to help reduce dyspnea, and advice when to seek help and improve decision making during exacerbation. Discussion of end of life care may also be appropriate.

Nutritional counseling should also be discussed because high and low BMI’s correlate with mortality in COPD patients. Nutritional supplements alone may not be a sufficient strategy.

Different centers have different approaches to the above, but the evidence suggests a huge impact on the patient’s ability to cope and reduce risk with this disease.[1]

There should be appropriate assessment and follow-up with appropriate history and physical examination, assessment of exercise capacity, measurement of post bronchodilator spirometry, symptom assessment by mMRC or CAT score, and review of upper and lower limb strengths in those who suffer from muscle wasting.
Back to our patient:
Pulmonary Rehab was ordered for June. Other aspects of her treatment remained the same.

This patient was booked for follow-up in three months, but did not return until six months later. She reports an improvement in symptoms, which she attributes to her rehab program. She has not had an exacerbation during this time period, and is taking all of her medications.

Her physical examination and vitals were similar to her previous visit. She had cut her smoking to “one or two a day”. Spirometry revealed the following:
- Post bronchodilator FVC 56%
- Post bronchodilator FEV₁ 25%
- Post bronchodilator FEV₁/FVC 0.35

This shows a decrease in the FEV₁ and the FVC but a slight improvement in the FEV₁/FVC over the initial testing.

Her pulse oximetry was 91% in a stable environment while wearing her oxygen.

An option was made to the patient to add a LAMA to her regimen, which she refused. She felt that her disease was stable with no recent hospitalization and her counseling during pulmonary rehab actually reduced her depression.

With an acceptable inhaler technique, stability of her disease process, and her own wishes regarding her care, no further changes were made to her regimen. A recheck appointment following a spirometry test was suggested in six months.

9. Existing medications for COPD have been shown to modify the long-term decline in lung function when this is tested as a primary or secondary outcome in clinical trials.
   a. True
   b. False

The therapeutic options recommended by GOLD have been discussed earlier and one must remember that the choice between a beta₂ agonist, anticholinergic, or combination therapy depends on the availability and individual response in terms of side effects and perceived symptom relief.[1] Unfortunately, none of these medications have been shown to modify long-term decline in lung function or reduce mortality. Many of these drugs however improve FEV₁ and lung volumes and health-related quality of life, as well as reducing exacerbation rates and improving key components of COPD therapy.[1] Some of them also have an effect on exacerbation-related hospitalizations and have been shown to improve the effectiveness of pulmonary rehab.

Newer therapies that have emerged over the past several years include a LAMA in a dry powder inhaler, which flags the patient and gives an audible sound if it is used correctly. The first PDE₄ inhibitor has also been introduced although it has only been shown to
reduce exacerbations in severe to very severe COPD when there is a history of exacerbations and chronic bronchitis. It is not a bronchodilator. A new once-daily LABA as well as a once-daily ICS/LABA have also been recently introduced, and as this was being written a new once daily LAMA/LABA has been approved by the FDA. The latter combination is currently a second choice in the GOLD guidelines for Classes B and C, but many pulmonologists expect that this will change over time.

All of these with respective dosages and their methods of administration are well covered in the updated 2013 GOLD Guidelines.[1] Again, it is important to remember that while none of these have been shown to have clinical superiority over similar drugs in the same or different classes, the different means of administration may be important for many patients. Use the 2013 updated GOLD Guidelines to review the various medication and their side effect profiles.

In conclusion, by using the GOLD Guidelines, which are heavily based on international consensus dictating levels of evidence for important recommendations, we can all offer our patients a level of stability, improvement in the quality of life, and reduction in exacerbations and hospitalizations not seen before.

References


7. Bestall JC; Paul EA; Garrod R; Jones PN; Wedzicha JA. Usefulness of the mMRC Dyspnea Scale as a Measure of Disability of Patients with COPD. Thorax. 1999; 54:581-586.
