COPD
A Breath of Fresh Air

Clare Hawkins, MD, FAAFP
SW Regional Medical Officer
Aspire Healthcare/Anthem
Speaker Disclosure

• Dr. Hawkins has disclosed that he has no actual or potential conflict of interest in relation to this topic.
Learning Objectives

By the end of this activity, the participant should be better able to:

1. **Evaluate patients** who are current or former smokers, and those who develop frequent viral infections, **for symptoms that may indicate COPD** or related conditions

2. Interpret and **validate results** in symptomatic patients

3. Prepare **treatment plans** that include a combination approach to therapy for patients who have COPD.

4. Counsel patients who have COPD on the importance of **quitting smoking** and receiving annual **vaccinations** for influenza and pneumonia.
Epidemiology of COPD

• Third leading cause of death in the US\(^1\)
• 15.2% of adults had a diagnosis of COPD in 2010\(^2\)
• $36 billion dollars annually in 2010, and costs are expected to rise to $49 billion for medical costs alone by 2020\(^3\)
• Worldwide, an estimated 74 million deaths were caused by COPD in 2015\(^4\)

\(^1\) CDC 2016, \(^2\) Adeloye et al 2015, \(^3\) Ford et al, 2015, \(^4\) WHO Fact sheet 2016
COPD Phenotypes

- Overlapping
- Some COPD without classic features
2. Testing for COPD

- Physical Exam*
- Office Spirometry
- Other Pulmonary Function Testing
- Chest X-ray & CT
- ECG

*Holleman 1995
Diagnosis

- Spirometry as the mainstay of diagnosis
- Simple, inexpensive, but sometimes confusing
- Spirometry classification of COPD patients by GOLD COPD has utility but does not easily explain illness trajectory
- Health Status Measures assist (CAT and MRC dyspnea Scale)
Three Numbers

- **FVC**: Forced Vital Capacity
- **FEV1**: Amount breathed out in 1 second
- **FEV1/FVC**: How much of your lung’s air can be exhaled in the first second
  - Measure of caliber or function of airway
  - NOT A COMPARISON TO REFERENCE VALUES
- More accurate than Peak Flow
Lung Volumes

(ERV + RV = Functional Residual Capacity)

- Inspiratory Capacity
- Tidal Volume
- Expiratory Reserve Volume
- Residual Volume

Vital Capacity
Dynamic Hyperinflation

- Vital Capacity
- Inspiratory Capacity
- Tidal Volume
- Expiratory Reserve Volume
- Residual Volume
### Severity of Obstruction (GOLD)

<table>
<thead>
<tr>
<th>FEV1</th>
<th>% of predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>&gt;80</td>
</tr>
<tr>
<td>Moderate</td>
<td>50 to 79</td>
</tr>
<tr>
<td>Severe</td>
<td>30 to 49</td>
</tr>
<tr>
<td>Very severe</td>
<td>&lt;30 *</td>
</tr>
</tbody>
</table>

### Severity of Restriction

<table>
<thead>
<tr>
<th>FVC</th>
<th>% of predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>&gt;65 to 80</td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt;50 to 64</td>
</tr>
<tr>
<td>Severe</td>
<td>&lt;50</td>
</tr>
</tbody>
</table>
FEV 1 Thresholds (GOLD)

- Grade 1: Mild \( \text{FEV1} > 80\% \)
- Grade 2: Moderate \( 50\% < \text{FEV1} < 80\% \)
- Grade 3: Severe \( 30\% < \text{FEV1} < 50\% \)
- Grade 4: Very Severe \( \text{FEV1} < 30\% \)

- Compared with predicted values in patients with post-bronchodilator \( \text{FEV1/FVC} < 70 \)
Caveat

• FEV1/FVC 70
  – Overestimates COPD diagnosis in Elderly
  – Underestimates COPD diagnosis in those under age 45
Normal Flow Volume Curve (Expiratory)
Normal, Obstructed, & Restrictive Curves
Audience Polling #1
The most common cause of an Obstructive Pattern is

1. Pleural Effusion
2. Pulmonary Fibrosis
3. COPD and Asthma
4. Pulmonary Embolus
Inspiratory Volume Loop

Expiratory

Flattened Inspiratory Loop Indicating possible Extrathoracic Obstruction
Is FEV₁ / FVC Ratio Low? (<70%)

- **Yes**
  - Obstructive Defect

Is FVC Low? (<80% pred)

- **Yes**
  - Combined Defect of Obstruction and Restriction /or Hyperinflation
    - Reversible Obstruction and improved FVC with β-agonist
    - Further Testing with Full PFT’s
- **No**
  - Pure Obstruction
    - Reversible Obstruction with β-agonist
      - Yes
        - Suspect Asthma
      - No
        - Suspect COPD

Adapted with permission from J S Lowry
Common Obstructive Disorders

• Diffuse Airway Disease
  – Asthma
  – COPD
  – Bronchiectasis
  – Cystic Fibrosis

• Upper Airway Obstruction
  – Foreign Body
  – Neoplasm
  – Tracheal Stenosis
  – Tracheomalacia
  – Vocal Cord Paralysis
Is FEV₁ / FVC Ratio Low? (<70%)

- No
  - Is FVC Low? (<80% predicted)
    - Yes: Restrictive Defect
      - Further Testing with Full PFT’s and consider referral
    - No: Normal Spirometry

Diagnostic Flow Diagram, Restriction
Common Restrictive Disorders

Parenchymal
- Interstitial Lung Diseases
  - Fibrosis
  - Granulomatosis (TB)
  - Pneumoconiosis
  - Pneumonitis (lupus)
- Loss of Functioning Tissue
  - Atelectasis
  - Large Neoplasm
  - Resection
- Pleural
  - Effusion
  - Fibrosis
- Chest Wall
  - Kyphoscoliosis
  - Neuromuscular Disease
  - Trauma
- Extrathoracic
  - Abdominal Distension
  - Obesity
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>ICD-9</th>
<th>ICD-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>786.2</td>
<td>R05</td>
</tr>
<tr>
<td>Simple chronic bronchitis</td>
<td>491.0</td>
<td>J41.0</td>
</tr>
<tr>
<td>Mucopurulent chronic bronchitis without exac</td>
<td>491.2</td>
<td>J44.9</td>
</tr>
<tr>
<td>Acute bronchitis</td>
<td>466.0</td>
<td>J20.9</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease w exac</td>
<td>496.0</td>
<td>J44.1</td>
</tr>
<tr>
<td>Shortness of breath/dyspnea</td>
<td>786.0</td>
<td>R06.00</td>
</tr>
<tr>
<td>Pulmonary Fibrosis</td>
<td>515</td>
<td>J84.10</td>
</tr>
<tr>
<td>Asthma</td>
<td>493.90</td>
<td>J45.909</td>
</tr>
</tbody>
</table>
## Coding and Reimbursement

<table>
<thead>
<tr>
<th>Procedure</th>
<th>CPT Code</th>
<th>Reimbursement*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single spirometry</td>
<td>94010</td>
<td>$32.82</td>
</tr>
<tr>
<td>Pre-post spirometry</td>
<td>94060</td>
<td>$57.71</td>
</tr>
<tr>
<td>Pulmonary stress test simple</td>
<td>94620</td>
<td>$71.77</td>
</tr>
<tr>
<td>Medication administration bronchodilator supply separate</td>
<td>94640</td>
<td>$13.34</td>
</tr>
<tr>
<td>Demonstration / instruction</td>
<td>94664</td>
<td>$14.79</td>
</tr>
<tr>
<td>Smoking Cessation &lt;8x/ yr</td>
<td>99406</td>
<td>$12.98</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office spirometer</td>
<td>$1,500 – 2,500</td>
</tr>
</tbody>
</table>

Reimbursements based on Medicare payments 2009 Trailblazer Spirometry cost estimated from several vendors
COPD Assessment Test (CAT):

- CAT: An 8-item measure of health status impairment in COPD
- CCQ: Clinical COPD Questionnaire (CCQ):
  - Self-administered questionnaire developed to measure clinical control in patients with COPD (http://www.ccq.nl)
- mMRC dyspnea: Breathlessness Measurement using the Modified British Medical Research Council:
  - Relates well to other measures of health status and predicts future mortality risk

http://catestonline.org
<table>
<thead>
<tr>
<th>CAT (COPD Assessment Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I never cough</td>
</tr>
<tr>
<td>I have no phlegm in my chest at all</td>
</tr>
<tr>
<td>My chest does not feel tight at all</td>
</tr>
<tr>
<td>When I walk up a hill or one flight of stairs I am not breathless</td>
</tr>
<tr>
<td>I am not limited doing any activities at home</td>
</tr>
<tr>
<td>I am confident leaving my home despite my lung condition</td>
</tr>
<tr>
<td>I sleep soundly</td>
</tr>
<tr>
<td>I have lots of energy</td>
</tr>
<tr>
<td>CAT Score</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>&lt;10</td>
</tr>
<tr>
<td>10–20</td>
</tr>
<tr>
<td>21–30</td>
</tr>
</tbody>
</table>
mMRC Dyspnea Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>I only get breathless with strenuous exercise</td>
</tr>
<tr>
<td>1</td>
<td>I get short of breath when hurrying on the level or walking up a slight hill</td>
</tr>
<tr>
<td>2</td>
<td>I walk slower than people of the same age on the level because of my breathlessness, or I have to stop for breath when walking on my own pace on the level</td>
</tr>
<tr>
<td>3</td>
<td>I stop for breath after walking about 100 meters or a few minutes on the level</td>
</tr>
<tr>
<td>4</td>
<td>I am too breathless to leave the house or I am breathless when dressing or undressing</td>
</tr>
</tbody>
</table>
Prognosis Model in COPD
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Spirometric Class</th>
<th>Exac/ yr</th>
<th>CAT</th>
<th>mMRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk, Less Symptoms</td>
<td>Gold 1-2</td>
<td>&lt;1</td>
<td>&lt;10</td>
<td>0-1</td>
</tr>
<tr>
<td>Low Risk, More Symptoms</td>
<td>Gold 1-2</td>
<td>&lt;1</td>
<td>&gt;10</td>
<td>&gt;2</td>
</tr>
<tr>
<td>High Risk, Less Symptoms</td>
<td>Gold 3-4</td>
<td>&gt;2</td>
<td>&lt;10</td>
<td>0-1</td>
</tr>
<tr>
<td>High Risk, More Symptoms</td>
<td>Gold 3-4</td>
<td>&gt;2</td>
<td>&gt;10</td>
<td>&gt;2</td>
</tr>
</tbody>
</table>
3. Treatment Plans

- Medications for stable COPD
- Medications for COPD exacerbations
- Pulmonary rehabilitation
- Oxygen therapy
- Comorbidities
- End-of-life care
GOALS

• Relieving symptoms
• Slowing disease progression
• Enhancing exercise tolerance and functional status
• Preventing and treating complications
• Improving overall health
### 3. Treatment Plans: Stable COPD

<table>
<thead>
<tr>
<th>Grade 1 Mild</th>
<th>Grade 2 Moderate</th>
<th>Grade 3 Severe</th>
<th>Grade 4 Very Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV1 &gt; 80</td>
<td>FEV1 50-80</td>
<td>FEV1 30-50</td>
<td>FEV1 &lt; 30 Or &lt; 50 with Cor Pulmonale</td>
</tr>
<tr>
<td>PCV 23,13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza</td>
<td>LABA and/or LAMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; SABA</td>
<td></td>
<td>ICS for recurrent exacerbations</td>
<td>Pulmonary Rehab</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Oxygen &amp; LVRS?</td>
</tr>
</tbody>
</table>
Medication Categories

- Short-Acting Beta Agonist (SABA)
- Short-Acting Anticholinergic
- Long-Acting Anticholinergic (LAMA)
- Long-Acting Beta Agonist (LABA)
- Inhaled Corticosteroid (ICS)
Long-Acting Beta Agonists LABA

- **SERAVENT** diskus, (salmeterol) DPI device
- **FORADIL** Aerolizer, (formoterol) DPI
- **BROVANA**, (arformoteral) nebulized
- **PERFORMIST**, (salmeterol) DPI
- **STRIVERDI** Respimat, (olodaterol) DPI
- **ARCAPTA** Neohaler, (indacaterol) DPI
Inhaled Corticosteroid, ICS

- **FLOVENT** MDI or Diskus (44, 110, 220 fluticasone) DPI Device
- **QVAR** MDI (40 & 80 beclomethasone) HFA MDI
- **ASMANEX** Twisthaler
- **PULMICORT** Tubohaler, (200 budesonide) (DPI Device)
- **PULMICORT** Flexhaler, (90 & 180 budesonide) DPI Device
- **PULMICORT** Respules (budesonide) Neb bid
- **AEROSPAN** Aerosol, (80 & 160 flunisolide) HFA MDI
- **ALVESCO** Aerosol, (80 & 160 ciclesonide) HFA MDI
- **ASMANEX** HFA MDI, (100 & 200 mometasone) DPI
- **ARNUITY** Ellipta, (100 & 200 fluticasone) DPI
Combo LABA & ICS

- **ADVAIR** Diskus, salmeterol & fluticasone, 250/50, (230/21 bid MDI)
- **SYMBICORT**, formoterol & budesonide) (80/45, 160/45
- **BREO** Ellipta, daily (vilanterol & fluticasone)
- **DULERA** Aerosol, (100/5 and 200/5 ii bid (formoterol & mometasone)
Anticholinergic LAMA

• **SPIRIVA** Handihaler or Respimat, tiotropium DPI
• **INCRUSE** Ellipta, (umeclidinium) DPI
• **SEEBRI** Neohaler, (glycopyrrolate) DPI
LAMA & LABA

- **ANORO** Ellipta (umeclidinium & vilanterol)
- **STIOLTO** Respimat (tiotropium & olodaterol)
- **UTIBRON** Neohaler (glycopyrrolate & indacaterol)
- **BEVESPI** Aerosphere (formoterol & glycopyrrolate)
ICS, LAMA, LABA?

- **TRELIBY**: Fluticasone, Umeclidinium, vilanterol
Inhaler Technique

• 50% of people use their inhaler incorrectly
• Many health care providers can’t demonstrate
• Have them line up their inhalers
  – Have them contrast rescue from maintenance
  – Have them store or d/c ones from previous formulary
• Have them take them out and show you how they use them (and how often)
Medication Adherence

• Review dose counter to see if “on track”
• LABA & LAMA don’t have immediate effect that patients expect
• Outline refill rate. Is it monthly?
• Review “donut hole” and formulary issues
  – Consider using needy meds or low income subsidy
    • www.needymeds.com
MDI vs. “NEBS”

- Nebulized medications may be necessary if patient has severely limited inspiratory capacity
- Beta Agonist excess = Tremor, Anxiety, Tachycardia (But similar to popular caffeine supplement drinks)
- “Part B” Medicare not “Part D”, so can be used in the donut hole
- I.e. “Arformoterol” LABA ~ $800/month
Audience Polling Case
COPD Exacerbation

- 58 yo Asian Male
- COPD x 5 years
- Continues to smoke
- Dyspnea with minimal exertion
- Increased cough with sputum
- Increased sputum purulence
- Three similar exacerbations in past 12 months
Audience Polling #2
The best treatment for this exacerbation is?

1. Tapering dosage of methylprednisolone
2. Guerilla-cillin in high doses
3. Prednisone 40 mg daily x 5 days
4. Immediate hospital admission
3. Treatment Plan: Exacerbations

- Oral Steroids = IV steroids within 1 hour. Prednisone 40 mg daily 5 days\(^1\)
- Antibiotics: Amox/Clav, Doxycycline, TMP/SMX, Quinolone, or others
- Bronchodilators
- Oxygen +/- hospitalization if desaturating

\(^1\) Leuppi 2013
COPD Interventions #1 E-kit

• Prednisone 40 mg daily x 5 days
  – No other doses, no Medrol dose pack, ....

• Antibiotic of choice
  – Bactrim, Doxycycline, Azithromycin, Amox-Clav

• Fill Prescription

• Keep in fridge

• Begin if; change in volume or purulence
  – Change in dyspnea
Infectious vs. Non Infectious Exacerbations

• 2/3 will need antibiotics
• If no change in sputum or fever, but only dyspnea, and no evidence of pneumothorax then may just need steroid

Anthonisen 1987
Preventing Recurrent Exacerbations

• LABA/LAMA therapy with good technique
• Macrolide therapy daily or 3 x per week
  – Antibiotic resistance, hearing loss, QT interval
• PDE4 Inhibitor Roflumilast
  – Diarrhea, weight loss, nausea, headache, back pain, influenza, insomnia, dizziness, decreased appetite \(^1,^2\)

\(^1\)Chong 2013, \(^2\)Martinez 2015
Oxygen

• Evidence equivocal
  – If < 88% sat
  – > 16-18 h per day for decreased mortality
  – For exercise desaturation?
    • Improves exercise duration, no improvement in outcomes\(^1\)

GOLD 2018
What is Pulmonary Rehab

• Comprehensive, interdisciplinary intervention that includes;
  – Supervised exercise training
  – Patient education
  – Behavioral therapy
  – Lifestyle management

• Programs last from 8 to 12 weeks, with 2 to 3 weekly sessions
• Some evidence for home-based rehab especially for maintenance
Pulmonary Rehabilitation

• Should be prescribed for symptomatic patients with FEV1 < 50%, (SORT A)

• Could be considered for symptomatic or exercise limited patients FEV1 > 50% (SORT B)

• Pulmonary rehabilitation improved quality of life dyspnea, and exercise capacity compared to standard care. (SORT A)

Roman et al. 2013
3. Treatment Plans: Comorbidities

- Cardiovascular Disease
- Heart Failure
- Atrial Fibrillation
- Hypertension
- Osteoporosis
- Anxiety & Depression
- Diabetes
- Impaired cognitive function
3. Treatment Plans: End-of-Life Care

- COPD as third most common cause of death
- A story without a (well defined), beginning, middle or end
  - Dyspnea at rest
  - Frequent exacerbations
  - Weight loss
  - Recurrent intubation/ventilation
Case II Roger

- Roger is a 65 yo with advanced COPD, who you have seen for many years, and treated with multiple inhalers, oxygen and a few hospitalizations for exacerbations
- He has begun to lose weight and has severe exercise restriction in spite of maximal treatment
- Can you enter a conversation about prognosis?
- How?
Case II Roger 65 COPD “D”

• Multiple inhalers, oxygen and a few hospitalizations for exacerbations
• Has begun to lose weight and has severe exercise restriction in spite of maximal treatment
• How would you bring up the topic?
Audience Polling #3
How would you bring up the topic?

1. Tell him, there is nothing more medicine can do
2. Discuss how if he is intubated he will never come off the ventilator
3. Say, “I’m worried about you because I see signs that your disease is getting much worse”
Illness Trajectory: Chronic Illness
Organ Failure COPD or CHF

Exacerbation
Introducing the Topic

• “After looking at what has been going on in the past year, I think we should talk about where this appears to be going”
• “How do you feel about continuing to go to the hospital?”
• “When this happens again do you want to go on a breathing machine?”
• “Since we know that COPD will likely take your life, have you thought what it will be like to die?”
Audience Polling #4
The only thing which changes the natural history of COPD is

1. Anti-inflammatory therapy
2. Smoking cessation
3. Combined LABA and LAMA therapy
4. Pulmonary rehabilitation
4. Smoking Cessation & Vaccination

- **Ask:** At every visit about smoking status
- **Advise:** The hazards and impact of smoking
- **Assess:** Readiness to quit, set a quit-date
- **Assist:** Prescribe
- **Arrange:** Follow-up in person, telephonic or on-line

[https://www.cdc.gov/tobacco/quit_smoking/cessation/ngdw/index.htm](https://www.cdc.gov/tobacco/quit_smoking/cessation/ngdw/index.htm)
Medical Assistance with Quitting

• Nicotine Replacement (17% patch, 12.5% lozenges/gum, 2.4% spray/inhaler)
• Varenicline (7.9%)
• Bupropion XL 150 / d- 300 mg / d -2.7%

Quitting Smoking Among Adults — United States, 2000–2015, MMRW. January 6, 2017 / 65(52);1457–1464
https://www.cdc.gov/mmwr/volumes/65/wr/mm6552a1.htm?s_cid=mm6552a1_w
Varenicline

- Initiate regimen 1 week before quit smoking date
- Days 1-3: 0.5 mg PO qDay
- Days 4-7: 0.5 mg PO BID
- Day 8 to end of treatment: 1 mg PO BID
- If quitting is successful after 12 weeks, continue another 12 weeks at 1 mg q12hr
Varenicline

• SLOW QUIT METHOD: Reduce smoking by 50% from baseline within the first 4 weeks, by an additional 50% in the next 4 weeks

• Side Effects
  • Psychiatric relative contraindication (depression/ suicide)
  • Seizure contraindication
  • Reduce dose if GFR < 30 0.5 mg/d increase to bid
  • If on hemodialysis; maximum 0.5 mg/d
Vaccinations

• PCV 13 “Pneumococcal Conjugate”
• PCV 23 “Pneumococcal Polysaccharide”
  – Before and second dose after 65 (five years apart)
  – One year between Conjugate and Polysaccharide
• Influenza
  – Annually
Recommendations

1. Spirometry should be used to diagnose symptomatic patients (SOR A)
2. Spirometry should not be used to screen asymptomatic patients (SOR A)
3. Bronchodilators should be used for those with FEV1 60-80% predicted (SOR B)
4. Bronchodilators should be used for those with FEV1 < 60% (SOR A)
Recommendations

5. Oral Steroids = IV steroids within 1 hour. Prednisone 40 mg daily 5 days\(^1\) (SOR A)

6. Macrolide daily or 3 x week can reduce exacerbation frequency for those with FEV1 < 60% (SOR B)\(^2\)

7. Pulmonary Rehabilitation should be offered for those with FEV1 < 60% predicted\(^3\)

\(^1\) Lueppi REDUCE 2013, \(^2\) GOLD 2018 \(^3\)Pradella 2015
References

• GOLD COPD 2018
  – https://goldcopd.org/gold-reports/ Accessed Aug 5, 2018
References


References

• Leuppi JD. Short-term vs. Conventional Glucocorticoid Therapy in Acute Exacerbations of Chronic Obstructive Pulmonary Disease The REDUCE Randomized Clinical Trial. *JAMA*. 2013;309(21):2223-2231

References

- ACP Updates Guideline on Diagnosis and Management of Stable COPD Aug 2, 2011 www.aafp.org/fpm 2012
References


References

References


Contact

- chawkins@gmail.com
- 713-417-6894