COPD “Vital Inspiration”
TAFP Texas Family Medicine Symposium 2020

Clare Hawkins, MD, MSc, FAAFP
West Region Medical Officer
Aspire Healthcare

Disclosure

• Dr. Hawkins has disclosed that neither he nor members of his immediate family have any actual or potential conflict of interest.

Objectives

By the end of this educational activity, the learner 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\(^2\)
• 14% of adults 14-70 had COPD in 2013\(^3\)
• $36 billion dollars annually in 2010, and costs are expected to rise to $49 billion for medical costs alone by 2020\(^4\)
• Worldwide, an estimated 74 million deaths were caused by COPD in 2015\(^5\)

\(^1\) CDC 2016, \(^2\) Adeloye et al 2015, \(^3\) Tilert et al 2013, \(^4\) Ford et al, 2015, \(^5\) WHO fact sheet 2016

COPD Phenotypes

Overlapping Some COPD without classic features

Chronic Bronchitis
Emphysema
Asthma
No Phenotype

2. Testing for COPD

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

*Hilleman 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

- **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

Dynamic Hyperinflation

### Severity of obstruction (GOLD)

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

### Severity of restriction

<table>
<thead>
<tr>
<th>Severity of restriction</th>
<th>FVC</th>
<th>% of predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>&gt;65 to 80</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt;50 to 64</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>&lt;50</td>
<td></td>
</tr>
</tbody>
</table>

FEV₁ Thresholds (GOLD)

- Grade 1: Mild FEV₁ > 80%
- Grade 2: Moderate 50% < FEV₁ < 80%
- Grade 3: Severe 30% < FEV₁ < 50%
- Grade 4: Very Severe FEV₁ < 30%

Compared with predicted values in patients with post-bronchodilator 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

Inspiratory Volume Loop

Common Obstructive Disorders

Diffuse Airway Disease
- Asthma
- COPD
- Bronchiectasis
- Cystic Fibrosis

Upper Airway Obstruction
- Foreign Body
- Neoplasm
- Tracheal Stenosis
- Tracheomalacia
- Vocal Cord Paralysis
Diagnostic Flow Diagram, Restriction

Is FEV₁/FVC Ratio Low? (<70%)

- Yes
  - Restrictive Defect
    - Further Testing with Full PFT's and consider referral
  - Normal Spirometry
- No

Restrictive Defect

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

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://www.ccq.nl

Coding and Reimbursement

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>ICD-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>R05</td>
</tr>
<tr>
<td>Simple chronic bronchitis</td>
<td>J41.0</td>
</tr>
<tr>
<td>Mucopurulent chronic bronchitis</td>
<td>J44.9</td>
</tr>
<tr>
<td>without exacerbation</td>
<td></td>
</tr>
<tr>
<td>Acute bronchitis</td>
<td>J20.9</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary</td>
<td>J44.1</td>
</tr>
<tr>
<td>disease w exacerbation</td>
<td></td>
</tr>
<tr>
<td>Shortness of breath/ dyspnea</td>
<td>R06.00</td>
</tr>
<tr>
<td>Pulmonary Fibrosis</td>
<td>J84.10</td>
</tr>
<tr>
<td>Asthma</td>
<td>J45.509</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>
<tr>
<td>Equipment Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office spirometer $1,500 – 2,500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reimbursements based on Medicare payments 2009 TrailBlazer Spirometry cost estimated from several vendors

CAT (COPD Assessment Test)

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I never cough</td>
<td>1</td>
<td>I cough all the time</td>
</tr>
<tr>
<td>I have no phlegm in my chest at all</td>
<td>2</td>
<td>My chest is full of phlegm</td>
</tr>
<tr>
<td>My chest does not feel tight at all</td>
<td>3</td>
<td>My chest feels very tight</td>
</tr>
<tr>
<td>When I walk up a hill or one flight of stairs I am not breathless</td>
<td>4</td>
<td>When I walk up a hill or one flight of stairs I am very breathless</td>
</tr>
<tr>
<td>I am not limited doing any activities at home</td>
<td>5</td>
<td>I am very limited doing activities at home</td>
</tr>
<tr>
<td>I am confident leaving my home despite my lung condition</td>
<td>1</td>
<td>I am not at all confident leaving my home because of my lung condition</td>
</tr>
<tr>
<td>I sleep soundly</td>
<td>2</td>
<td>I don't sleep soundly because of my lung condition</td>
</tr>
<tr>
<td>I have lots of energy</td>
<td>3</td>
<td>I have no energy at all</td>
</tr>
<tr>
<td>I am not at all confident leaving my home</td>
<td>4</td>
<td>I am very limited doing activities at home</td>
</tr>
<tr>
<td>I am confident leaving my home despite my lung condition</td>
<td>5</td>
<td>I am not at all confident leaving my home because of my lung condition</td>
</tr>
</tbody>
</table>

http://www.ccq.nl
### 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>A 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>B 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>C 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>D 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>

### mMRC Dyspnea Scale

<table>
<thead>
<tr>
<th>Symptom</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>

### 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 or Stage A</th>
<th>Grade 2 or Stage B</th>
<th>Grade 3 or Stage C</th>
<th>Grade 4 or Stage D</th>
<th>Very Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
<td>FEV1 &lt; 30</td>
<td>Or &lt; 50 with Cor Pulmonale</td>
</tr>
<tr>
<td>FEV1 &gt; 80</td>
<td>FEV1 50-80</td>
<td>FEV1 30-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCV 23,13</td>
<td>LABA and/or LAMA</td>
<td>ICS for recurrent exacerations</td>
<td>Pulmonary Rehab</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)

### 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

### Long-Acting Beta Agonists LABA
- **SERAVENT** Diskus, (salmeterol) DPI device
- **FORADIL** Aerolizer, (formoterol) DPI
- **BROVANA** (arformoterol) nebulized
- **PERFORMIST** (salmeterol) DPI
- **STRIVERDI** Respimat, (olodaterol) DPI
- **ARCAPTA** Neohaler, (indacaterol) 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**
- **TRELIGY**: 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 (improving CMS benefit 2020)
- 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.. BROVANA Arformoterol (nebulized LABA) ~ $800/month
ARS 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

3. Treatment Plan: Exacerbations

- Oral Steroids = IV steroids within 1 hour. Prednisone 40 mg daily 5 days
- Antibiotics if infection suspected: Based on sputum volume, purulence & dyspnea
- Bronchodilators
- Oxygen +/- hospitalization if desaturating

COPD Interventions #1 E-kit

- Prednisone 40 mg daily x 5 days
  - No other doses, no Medrol dose pack...
- Antibiotic of choice
  - Amoxicillin, 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

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

Oxygen

- Evidence equivocal
  - If < 88% sat
  - > 15 hours per day for decreased mortality
- 1970s 1970s and involved a total of 290 patients
- 2016 738 patient unblinded RCT
- For exercise desaturation?
  - Improves exercise duration, no improvement in outcomes
What is Pulmonary Rehabilitation?
• 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
  – Is underutilized

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)

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?
Illness Trajectory: Chronic Illness
Organ Failure COPD or CHF

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?”

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. MMWR. January 6, 2017 / 65(52);1457–1464
https://www.cdc.gov/mmwr/volumes/65/wr/mm6552a1.htm

Varenicline

- Initiate regimen 1 week before quit smoking date
- Days 1-3: 0.5 mg PO daily
- 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


Natural History of Smoking

https://www.cdc.gov/tobacco/quit_smoking/cessation/nqdw/index.htm

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
Varenicline Effectiveness

- 6 months abstinence: Varenicline 33.2% compared with 23.4% for the nicotine patch and 24.2% for bupropion

Varenicline OTC?

- Research has shown safety for varenicline in patients with behavioral health disorders
- FDA removed the psychiatric warning from both varenicline and bupropion in 2016
- Evidence of excess Cardiovascular Risk related to varenicline refuted
- Reduce dose if GFR < 30 0.5 mg/d increase to bid
- Still advise caution for use in patients with seizure disorder

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)
5. Oral Steroids = IV steroids within 1 hour. Prednisone 40 mg daily 5 days
6. Macrolide daily or 3 x week can reduce exacerbation frequency for those with FEV1 < 60% (SOR B)
7. Pulmonary Rehabilitation should be offered for those with FEV1 < 60% predicted

---

1. Lueppi REDUCE 2013, GOLD 2018 Wedlake 2005
References

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

References


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Contact

• chawkins@gmail.com
• (713) 417-6894