Assessment and Management of COPD Patients in Primary Care: Tools and Technologies to Guide Treatment Decisions

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Agenda

I. Welcome and Introduction

II. Screening Initiatives and COPD Diagnoses in Early Stages
   a) Patient profiles early in disease course
   b) Lung function decline in mild, moderate, and severe COPD
   c) Definition of a COPD exacerbation
   d) Identifying at-risk patients: tools and questionnaires (mMRC and CAT)
   e) PEF and spirometry: feasibility, necessity, and alternatives

III. COPD Pocket Consultant Guide: Implementing Evidence-based Recommendations
   a) PCG and the COPD Care Algorithm
   b) COPD severity domains and guideline recommendations
   c) Pharmacologic escalation and de-escalation strategies: symptoms, severity, and exacerbation risk
   d) Comparison of different classes and combination of agents

IV. Facilitating Compliance: New Pharmacologic and Non-pharmacologic Strategies
   a) Patient engagement and disease education
   b) Provider-patient communication tools, mobile app
   c) Safety and efficacy of new agents
   d) Comprehensive nonpharmacologic strategies

V. Question & Answer Session; Post-test and Evaluation
The Impact of COPD

- ~15 million people diagnosed (additional 12M are undiagnosed)
  - 14% of US population (age 40-79) have COPD
  - 2\textsuperscript{nd}-leading cause of disability
  - 3\textsuperscript{rd}-leading cause of 30-day readmissions
  - 3\textsuperscript{rd}-leading cause of death (2\textsuperscript{nd} to CV disease and cancer)
- Mortality rate predicted to increase by 30% over the next decade
- Exacerbations
  - ~800,000 hospitalizations (+ 3.5 million COPD 2\textsuperscript{nd} dx)
  - 1.5 million ER visits/year
- Costs for COPD in the United States, 2010 = $50 billion and rising


COPD Screening and Diagnosis

CASE 1
52-year-old Woman with Productive Cough and Breathlessness

- History of present illness
  - Cough x 5 days, yellow sputum and chest congestion after visiting family the prior weekend
- Past medical history
  - Hypertension
  - Similar ‘bronchitis’ episode earlier this year treated with a Z-pack and steroid taper in Urgent care
- Social history
  - Works as a beautician
  - 2 ppd for 30 years
- ROS
  - Progressive exertional dyspnea x 10 years
- Physical examination
  - Afebrile, RR 22, mild distress, Saturations 98%
  - Mild forced expiratory wheezing
Prevalence of COPD Is Higher in Women

Age-adjusted prevalence of self-reported, physician-diagnosed COPD in US (adults aged ≥25 years)


Screening for COPD
Does Spirometry Decrease Morbidity or Mortality?

In asymptomatic patients, the USPSTF does not recommend routine use of spirometry to screen for obstructive lung disease

M/M = morbidity/mortality; USPSTF = US Preventive Services Task Force
High Index of Suspicion for COPD Screening and Diagnosis
Pathways for the Diagnosis of COPD

**SYMPTOMS**
- Shortness of breath
- Chronic cough
- Sputum

**RISK FACTORS**
- Host factors
- Tobacco
- Occupation
- Indoor/outdoor pollution

**SPIROMETRY**
Required to establish diagnosis


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**Early Disease: Spiromics**

- In patients not meeting current diagnostic criteria for COPD, 50% of current and former smokers had exacerbations, high symptom burden (CAT >10), activity limitation, and evidence of airway disease
- This cohort were current smokers, younger (Mean age <65) and had a higher body mass index (BMI), chronic bronchitis diagnosis, as well as a history of childhood asthma

Assessment and Management of COPD Patients in Primary Care
Tools and Technologies to Guide Treatment Decisions

Spiromics

Patients with Significant Symptoms Have Increased Rate of Exacerbations Regardless of Airflow Obstruction

The Refined ABCD Assessment Tool: GOLD 2017

Spirometrically confirmed diagnosis
Assessment of airflow limitation
Exacerbation history
Assessment of symptoms/risk of exacerbations

CAT = COPD Assessment Test; FEV₁ = forced expiratory volume in one second; FVC = forced vital capacity; mMRC = Modified Medical Research Council
GOLD Assessment Tools

<table>
<thead>
<tr>
<th>mMRC Breathlessness Scale</th>
<th>COPD Assessment Test (CAT)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>Description of Breathlessness</td>
<td>Rate 0-5 for each item</td>
</tr>
<tr>
<td>0</td>
<td>I only get breathless with strenuous exercise</td>
<td>I never cough</td>
</tr>
<tr>
<td>1</td>
<td>I get short of breath when hurrying on level ground or walking up a slight hill</td>
<td>I cough all the time</td>
</tr>
<tr>
<td>2</td>
<td>On level ground, I walk slower than people of the same age because of breathlessness, or have to stop for breath when walking at my own pace</td>
<td>I have no phlegm (mucus) in my chest at all</td>
</tr>
<tr>
<td>3</td>
<td>I stop for breath after walking about 100 yards or after a few minutes on level ground</td>
<td>My chest is not full of phlegm (mucus)</td>
</tr>
<tr>
<td>4</td>
<td>I am too breathless to leave the house or I am breathless when dressing</td>
<td>My chest feels very tight</td>
</tr>
</tbody>
</table>


COPD Assessment(s)

Self-reported Health Status

- COPD Assessment Test (CAT)
- modified Medical Research Council (mMRC)
- Clinical COPD Questionnaire (CCQ)
- St. George’s Respiratory Questionnaire (SGRQ)
- Chronic Respiratory Questionnaire (CRQ)

Severity Domains
2017 Update to the COPD Foundation COPD Pocket Consultant Guide

Spirometry Grades (SG)
- SG 0: Normal spirometry does not rule out emphysema, chronic bronchitis, asthma, or risk of developing either exacerbations or COPD
- SG 1: Mild: Post bronchodilator FEV₁/FVC ratio <0.7, FEV₁ ≥ 60% predicted
- SG 2: Moderate: Post bronchodilator FEV₁/FVC ratio <0.7, 30% ≤ FEV₁ < 60% predicted
- SG 3: Severe: Post bronchodilator FEV₁/FVC ratio <0.7, FEV₁ < 30% predicted
- SG U: Undefined: FEV₁/FVC ratio ≥ 0.7, FEV₁ < 80% predicted. This is consistent with restriction, muscle weakness, and other pathologies

Barriers to Diagnosing COPD in the Primary Care Setting

- Time limitations
- Failure to probe at-risk patients about symptoms and activity levels, and lack of good case-finding methods
- Limited spirometry availability and expertise to interpret results

- Care Providers
  - Under-recognition of symptoms, leading to delayed presentation
  - Poor awareness of COPD

- Patients
  - Lack of knowledge regarding COPD risk factors and appropriate diagnostic testing

Alternatives to Spirometry to Identify At-risk Patients

- Peak Expiratory Force (PEF), FEV1/FEV6 monitoring device
  - Significantly correlates with spirometric values (FEV1), FEV/FVC ratio, percent predicted, and GOLD categories (ABCD)
- Questionnaires
  - Capture, COPD-PS, COPD Diagnosis Questionnaire (CDQ), and Differential Diagnosis Questionnaire (DDQ)
- Combination of PEF and Questionnaire
  - Capture + PEF


Peak Expiratory Flow

- Advantages
  - Simple to use
  - Less time to perform
  - Can be performed daily
- Disadvantages
  - Not able to detect sudden changes in COPD
  - Cannot be used as a surrogate for FEV1 – does not find mild COPD
  - Does not determine the severity of airflow limitation (obstruction)

**Identifying Undiagnosed COPD: CAPTURE**

<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Yes</th>
<th>1 or 2 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have you ever lived or worked in a place with dirty or polluted air, smoke, second-hand smoke, or dust?</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>2. Does your breathing change with seasons, weather, or air quality?</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>3. Does your breathing make it difficult to do things such as carry heavy loads, shovel dirt or snow, jog, play tennis, or swim?</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>4. Compared to others your age, do you tire easily?</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>5. In the past 12 months, how many times did you miss work, school, or other activities due to a cold, bronchitis, or pneumonia?</td>
<td>0</td>
<td>1</td>
<td>2 or more</td>
</tr>
</tbody>
</table>

- This five-item questionnaire is used to assess exposure, breathing problems, tiring easily, and acute respiratory illnesses, as well as identifying patients in need of further diagnostic evaluation for COPD.
- In these patients, the addition of PEF can be useful for identifying patients in need of further diagnostic evaluation for COPD (score 3 or 4).
- Patients that answer yes to all items (score of 5 or 6) are considered to have a high likelihood of symptomatic lung disease and increased exacerbation risk.
  - These patients should be referred for further evaluation by spirometry.
- Low scores (1 or 2) do not warrant more testing.


**PEF + Capture Significantly Identifies COPD in Primary Care: ROC Curves for Comparisons**

COPD Exacerbations

Major criteria include:
- Dyspnea, sputum volume, and/or color/purulence
- Minor criteria include: wheeze, cough, sore throat, and fever
- An abrupt change in the day to day variability of symptoms: cough frequency, congestion, sputum production, and dyspnea for 2 consecutive days
  - However, there is no universally accepted standard definition of an acute exacerbation
- Infections cause ~75% of exacerbations: 25% bacterial, 25% viral, and 25% both
- Allergen and environmental pollutants account the the remainder of causes
- Exacerbations are characterized by increased systemic and airway inflammation

Exacerbation Definitions

- Mild COPD Exacerbation: a change in inhaled medications
- Moderate COPD Exacerbation: office visit or urgent care visit leading to steroid use, antibiotic use or both
- Severe COPD Exacerbation: emergency department stay or inpatient hospitalization


Instead of biomarkers of disease activity, the search for the ability to adapt and manage after an AECOPD may be the key toward lowering the impact of exacerbation on disease progression.

#1: Early Recovery #2: Late Recovery #3: Defect in Recovery
#4: Degree of Stress #5: Time to Recovery #6: Ideal state of Recovery

COPD is defined by post bronchodilator FEV1/FVC ratio <0.7 on spirometry

All COPD patients should have smoking cessation if smoking, vaccinations and be on a regular exercise program

Symptoms (CAT or MMRC) and Exacerbations

MMRC 0, 1 CAT < 10 Exacerbations <2/year

prn SABD Persistent Symptoms

MMRC ≥2, CAT ≥10 With or without exacerbations

LAMA or LAMA + LABA plus Pulmonary Rehabilitation Persistent Symptoms or Exacerbations

MMRC 0,1 CAT<10 Exacerbations ≥2/year

LAMA or LAMA + LABA or LABA + ICS

Implementing Evidence-based Recommendations
**Case: Charles**

- Age: 62
- Occasional cough, no sputum
- Diagnosed with COPD; 2 years with spirometry
- Ex-smoker; smoking history: 35 pack-years
- He is married with 2 children and works as a mail carrier
- No exacerbations
- Has hypertension, controlled with medication
- The patient is taking a LABA+ICS maintenance medication for COPD but frequently uses rescue inhaler 3 to 4 times per day
- When asked, he says he sometimes has to sit down to rest while delivering mail
- He also added that lately he is unable to play ball with his grandkids
- MMRC=2, CAT=12

**FEV1**: 1.31 (45%)
**FVC**: 2.48 (76%)
**Ratio**: 0.53

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**Pharmacologic Treatment Paradigm**

*Pharmacologic Treatment Algorithms by GOLD*

![Pharmacologic Treatment Paradigm Diagram](image)


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MEDX Atlanta – September 29, 2018
Pharmacologic Options

<table>
<thead>
<tr>
<th>Bronchodilators</th>
<th>Anti-inflammatory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SHORT-ACTING</strong></td>
<td><strong>ICS + LABA</strong></td>
</tr>
<tr>
<td>Anticholinergic (SAMA)</td>
<td>Fluticasone + salmeterol</td>
</tr>
<tr>
<td>Ipratropium</td>
<td>Budesonide + formoterol</td>
</tr>
<tr>
<td>Anticholinergic</td>
<td>Fluticasone + vilanterol</td>
</tr>
<tr>
<td>Tiotropium</td>
<td><strong>Beta2-agonists (LABA)</strong></td>
</tr>
<tr>
<td>Umeclidinium</td>
<td>Salmeterol</td>
</tr>
<tr>
<td>Glycopyrrolate</td>
<td>Formoterol</td>
</tr>
<tr>
<td><strong>LONG-ACTING</strong></td>
<td>Arformoterol</td>
</tr>
<tr>
<td>Anticholinergic</td>
<td>Indacaterol (ultra)</td>
</tr>
<tr>
<td><strong>Beta2-agonists (SABA)</strong></td>
<td></td>
</tr>
<tr>
<td>Albuterol</td>
<td></td>
</tr>
<tr>
<td>Levalbuterol</td>
<td></td>
</tr>
<tr>
<td>Metaproterenol</td>
<td></td>
</tr>
<tr>
<td>Pirbuterol</td>
<td></td>
</tr>
<tr>
<td><strong>SAMA + SABA</strong></td>
<td><strong>PDE-4 inhibitors</strong></td>
</tr>
<tr>
<td>Ipratropium + albuterol</td>
<td>Roflumilast</td>
</tr>
<tr>
<td><strong>Beta2-agonists (LABA)</strong></td>
<td><strong>Oral steroids</strong></td>
</tr>
<tr>
<td>LAMA + LABA</td>
<td>Prednisone</td>
</tr>
<tr>
<td>Umeclidinium + vilanterol</td>
<td>Methylprednisone</td>
</tr>
<tr>
<td>Glycopyrrolate + formoterol</td>
<td></td>
</tr>
<tr>
<td>Glycopyrrolate + indacaterol</td>
<td></td>
</tr>
<tr>
<td>Theophylline</td>
<td></td>
</tr>
</tbody>
</table>


**LAMA UPLIFT**

- 4-year trial to determine the long-term benefits of tiotropium on mortality, safety, exacerbations, and hospitalizations
- Delayed time to first exacerbation by 4 months
- **Reduced exacerbations per patient per year by 14%**
- Reduced risk of hospitalizations due to exacerbations
- Improved quality of life
- Reduced mortality due to heart or lung disease
- Post-hoc analysis demonstrates exercise capacity benefit in patients with mild to severe COPD

LABA

- Sustained bronchodilation without tolerance, improving airflow limitation >12 hours
- Maintenance therapy for patients with moderate to very severe COPD
- Improved lung function
- Reduced breathlessness
- Reduced exacerbations in patients with moderate to severe COPD
- Improved health status in patients with COPD


LABA/LAMA

**FLAME/LANTERN/FLIGHT**

- First-line therapy in moderate to severe COPD
- Significantly reduced COPD exacerbations
- Significantly improved lung function, dyspnea, and quality of life
- Significantly reduced rescue inhaler use
- Significantly reduced the risk of pneumonia compared to ICS containing inhaled therapy
- All combinations on market have similar cost-effectiveness ratios

# LABA/ICS

**TORCH**

- Ambitious 3-year, randomized trial to determine the effects of combination therapy fluticasone propionate/salmeterol 500/50 mcg BID on mortality, COPD exacerbations, hospitalizations, and quality of life in patients with moderate to severe COPD
- No mortality benefit, but...
  - Statistics trends toward benefit, as many in placebo left trial
- Decreased exacerbations by 25%, producing NNT=4 to prevent one exacerbation
- Decreased hospitalizations by 17%, but...
  - 49% increased risk of pneumonia, producing NNH=17


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# Fixed LAMA/LABA Combinations

<table>
<thead>
<tr>
<th>Drug</th>
<th>Approved Dose</th>
<th>Approval Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Umeclidinium/vilanterol</td>
<td>62.5/25 μg once daily (USA)</td>
<td>FDA approved 2013. EMA positive opinion 2014.</td>
</tr>
<tr>
<td></td>
<td>55/22 μg once daily (Europe)</td>
<td></td>
</tr>
<tr>
<td>Indacaterol/glycopyrronium (QVA149)</td>
<td>110/50 μg once daily –Europe, Canada, Japan, Latin America</td>
<td>EMA positive opinion 2013, FDA application complete for 27.5/12.5 μg twice daily.</td>
</tr>
<tr>
<td>Aclidinium/formoterol</td>
<td>340/12 μg twice daily</td>
<td>EMA positive opinion 2014</td>
</tr>
<tr>
<td>Tiotropium/olodaterol</td>
<td>2.5/2.5 μg two puffs once daily</td>
<td>FDA approved 2015.</td>
</tr>
<tr>
<td>Glycopyrronium/formoterol</td>
<td>9/4.8 μg two puffs twice daily</td>
<td>MDI format Pearl Pharmaceuticals</td>
</tr>
</tbody>
</table>

LABA/LAMA was superior to LABA/ICS in terms of annual rate and time to first exacerbation


If Initial Treatment Is Not Effective,
Re-evaluate the Situation

- Different clinical phenotype?
  - More frequent exacerbations?
  - Decline in FEV1?

- New comorbidities or complications?
  - Are comorbidities (e.g., cardiovascular disease, obstructive sleep apnea, anxiety/depression, malignancy) contributing?
  - Is there new hypoxemia?

- Patient nonadherence?
  - Side effects?
  - Improper device technique?
  - Health literacy (i.e., are roles of medications clear?)

- What are the patient’s treatment goals?
  - Chronic respiratory disease impacts each patient in a unique way depending on prior level of activity, current lifestyle, and goals
Phosphodiesterase 4 (PDE-4) Inhibitors

**Roflumilast**

- First studied in 2005 and FDA-approved in 2009, the PDE-4 class demonstrates improved quality of life, lung function, and exacerbations.
- PDE-4 is novel anti-inflammatory that decreases epithelial cell apoptosis, via increasing cAMP, thus decreasing macrophage activity and neutrophil recruitment.
- Effective in inflammatory endotypes, like chronic bronchitis.
- Indicated for patients with COPD exacerbation history.
- Significantly decreases the frequency of exacerbations.
- GI side effects and weight loss have limited widespread use.


Matching the Patient With the Delivery Device

*When choosing a delivery device, assess patients for:*

- Cognition
  - Dementia
  - Health literacy
- Dexterity
  - Hand grip strength
  - Arthritis
  - Breathe hand coordination
- Peak Inspiratory Flow Rate (PIFR)
  - Stature
  - Sex

*Improper use has been associated with:*

- Older age
- Lower education level (low health literacy)
- Lack of instruction from healthcare providers

Facilitating Compliance

New Pharmacologic and Non-pharmacologic Strategies

Individualizing Inhaled Therapy

• Good hand-breath coordination is required for meter-dose inhalers (MDIs)
  – May not be suitable for elderly, confused, or those with hand conditions (e.g. arthritis)
• Dry-powder inhalers (DPIs) do not require coordination of actuation and inhalation and are easier to use than MDIs
  – Breath actuation may be difficult in patients with poor inspiratory effort
• Nebulizers require cleaning and assembly
  – May require the skills of a caregiver

Some with High and Some with Low Resistance – Choice Is Important

When choosing a delivery device, assess PIFR:
- Peak inspiratory flow rate
- Measured in L/min
- PIF measured using the InCheck Dial device
  - Good accuracy +/- 10L/min, test-retest reliability

Non-pharmacologic Strategies

- Smoking Cessation
- Pulmonary Rehabilitation
- Vaccination
- Oxygen Therapy
- Surgical Nonsurgical Alternatives

**Assessment and Management of COPD Patients in Primary Care**

**Tools and Technologies to Guide Treatment Decisions**

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### Smoking Cessation Reduces Mortality

![Graph showing the reduction in mortality rate with smoking cessation.](image)

- **Rate of Death per 1,000 Person-Years**
- **Cause of Death**
  - CHD, CVD, Lung cancer, Other cancer, Respiratory disease, Other, Unknown

Adapted (and improved) from the BTS Statement: Pulmonary Rehabilitation.


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### Components of Pulmonary Rehabilitation

- Education, especially self-management training
- Physical exercise training
- Psychosocial intervention
- Nutrition assessment and intervention
- Outcome assessment

Adapted (and improved) from the BTS Statement: Pulmonary Rehabilitation.

Pulmonary Rehabilitation
Improves Exercise and Quality of Life at 1 Year

Exercise
Quality of Life (QoL)

Distance Walked (Meters)

Before 6 Weeks 1 Year

P = .000

P = .002

Rehab
Control

QoL (SGRQ Total Score)

Before 6 Weeks 1 Year

P = .000

P = .010

Rehab
Control

SGRQ = St. George’s respiratory questionnaire

Improved COPD Survival on Long-term Oxygen Treatment

Cumulative Survival (%)

Time (months)

NIH-COT
MRC-0₂
NIH-NOT
MRC controls

NIH-COT, National Institute of Health-Continuous Oxygen Therapy
MRC, Medical Research Council
NIH-NOT, National Institute of Health-Nocturnal Oxygen Therapy

Vaccines

- RCT comparing injectable pneumococcal polysaccharide vaccine or pneumococcal conjugated vaccine in people with COPD – reduced COPD exacerbation (OR 0.60, 95% CI 0.39 to 0.93)
  - Number Needed to Benefit (NNTB) to prevent a patient from experiencing an acute exacerbation was 8 (95% CI 5 to 58)¹

- Inactivated influenza vaccine in COPD patients resulted in a significant reduction in the total number of exacerbations per vaccinated subject compared with those who received placebo (weighted mean difference [WMD] -0.37, 95% confidence interval -0.64 to -0.11, P=0.006)²


Volume Reduction Surgery in Chronic Obstructive Pulmonary Disease: NETT Trial

- 1218 patients with severe COPD
- Rehabilitation
- Assess
  - CT distribution
  - Exercise performance
- Randomize
  - Surgery
  - Medical management
- Re-evaluate 6 months, yearly
- Assess
  - Survival
  - Exercise

Ideal COPD Treatment Team

- Comprise a COPD Treatment Team to approach the proper care and treatment of the patient:
  - Patient; Support person (family member or caregiver); PCP; Specialists
- The COPD Treatment Team should formulate an action plan to address specific issues that the patient may encounter.
- Specific instructions should accompany the action plan and be signed off on by all parties.
- Biennially, the COPD Treatment Team should update the action plan and their individual roles.
- If properly carried out, this action time will save time and ultimately improve patient outcomes.
- Technology can play a huge role in reducing the workload of sharing and transmitting information.
- Example apps for patients with COPD:
  - Medisafe, ZocDoc


COPD Patient Care Considerations

- Avoid rushing or appearing to rush through a visit.
- Avoid over-estimating your knowledge and competence. Seek a pulmonology consult.
- Avoid casting judgement about how the person got this disease – this patient has a chronic illness.
- Avoid allowing patients to become complacent in their treatment. Demand that they play an active role in care.
- Answer all of the questions that the patient has.
- Give the patient a folder with information related to his/her diagnosis and treatment. Request that the patient read over the materials and make at least one contact.
- Provide contacts for local support groups.
- Impress upon the patient that prompt medical attention is necessary to avoid major problems.
- Make same-day appointments available for your COPD patients.
Summary

• COPD is a costly, prevalent disease that should be screened in patients with risk factors and with symptoms suggestive of airflow obstruction
• Recognition of the many endotypes of COPD has not only improved maintenance management, but has also led to the development of therapies that decrease exacerbations and improve QoL, as well as exercise capacity
• GOLD 2017 recommendations support use of long-acting maintenance treatment in patients with high symptom burden and/or history of COPD exacerbation
• Non-pharmacologic management of COPD entails early referral to pulmonary rehabilitation, smoking cessation, and augmenting self-efficacy to remain physically active regardless of disease severity
• Primary care providers can initiate many strategies to ensure adherence to COPD therapies and to increase patient understanding

Thank you for joining us today!

Please remember to complete the EVALUATION.

Your participation will help shape future CME activities.