TOWARD BETTER COPD OUTCOMES
The Critical Role of Primary Care for Early Diagnosis and Guideline-directed Management

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Objectives

- Recognize the prevalence of COPD and the cost burden associated with its management
- Improve ability to apply GOLD 2017 guidelines to the management of symptomatic patients with COPD
- Gain insight into population screening for COPD
- Identify the mechanism of action and current classes of medication for maintenance management of COPD
- Recognize the role self-management plays in developing a treatment plan for patients with COPD
- Appreciate the benefit of physical activity and exercise in management of patients with COPD

Addressing Undertreatment

The Impact of COPD

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

Most COPD Costs Are Hospital-related

Age-standardized Prevalence of COPD Adults Aged 18 or Older

Data from Behavioral Risk Factor Surveillance System in 2011.
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Prevalence of COPD Is Higher in Women

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

Data from US National Health Interview Survey (1999-2011).

Burden of “Undiagnosed COPD” in United States: NHANES 2007-2010

- Participants with FEV1/FVC <0.70 or lower limit of normal (LLN) offered bronchodilator testing
- 796/1,490 adults underwent testing
- 385/794 had chronic airway obstruction (CAO)
- Weighted prevalence: 4.5% with CAO
- Overall estimated 7.7% prevalence
- Estimated 16.2 million had CAO during 2007-2010 (<50% with diagnosis)


Smoking Cessation & COPD: Beyond Fletcher-Peto 1977

- Fletcher-Peto demonstrated that with smoking cessation, the slope of lung function loss can be affected, suggesting earlier cessation preserves lung function

Phenotyping COPD

- Alpha 1 antitrypsin
- TH2/eosinophilic
- High systemic inflammation
- High symptoms with normal lung function
- Chronic bronchitis

Endotypes of COPD

- Understanding the heterogeneity within COPD allows pharmacologic targeting of specific mechanisms of injury, which leads to the different phenotypic expressions and disease presentations

52-year-old Woman with Cough and Breathlessness

- History of present illness
  - Cough x 5 days, yellow sputum
- Past medical history
  - Hypertension
- Similar ‘bronchitis’ episode earlier this year
- Social history
  - 2 ppd for 30 years
- ROS
  - Progressive exertional dyspnea x 10 years
- Physical examination
  - Afebrile, RR 22, mild distress
  - Mild forced expiratory wheezing

Barriers to Diagnosing COPD in the Primary Care Setting

- High Index of Suspicion for COPD Screening and Diagnosis

Algorithm for Interpreting Spirometry Results

- Alternatives to Spirometry to Identify At-risk Patients
  - Peak Expiratory Force (PEF), FEV1/FEV6 monitoring device
  - Significantly correlates with spirometric values (FEV1), FEV1/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

Hand-held Expiratory Flow Meter for COPD Screening

- A study was conducted to determine the accuracy of a hand-held expiratory flow meter to determine FEV1/FEV6 to screen for COPD in the primary care setting

- Current and former smokers (n=204; ≥50 years old), no previous respiratory diagnosis, were evaluated utilizing validated questionnaires, pre-bronchodilator FEV1/FEV6, and post-bronchodilator FEV1/FVC spirometry

- Results show this hand-held device provides reliable screening with sensitivity and specificity when compared to GOLD spirometric fixed airflow obstruction FEV1/FVC <0.70

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)
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COPDF-PS
- 5 questions
- Positively predicts airflow obstruction (AO)
- Higher scores suggest more severe AO

Identifying Undiagnosed COPD: CAPTURE

PEF + Capture Significantly Identifies COPD in Primary Care

Guidelines

Case: Charles
- Age: 58
- 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 not taking any 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 playing only 9 holes of golf instead of his usual 18
- MMRC=2, CAT=12

Pharmacological Therapy of Stable COPD GOLD 2017


Pharmacologic Options

- **Bronchodilators**
  - Short-acting
    - Anticholinergics (SAMA): Ipratropium
    - Long-acting
    - Anticholinergics (LAMA): Tiotropium
    - 2-lriters (SABA): Albuterol
    - Long-acting Muscarinic Antagonists (LAMA): Indacaterol
    - 2-lriters (LABA): Formoterol
    - LAMA + LABA: Tiotropium + formoterol
  - SAMA + SABA: Ipratropium + albuterol

- **Anti-Inflammatory**
  - Inhaled Corticosteroids (ICS)

- **Long-acting**
  - Formoterol + fluticasone
  - Tiotropium + fluticasone

- **Others**
  - Methylprednisolone

**Pharmacologic Treatment Paradigm**

**Pharmacologic Treatment Algorithms by GOLD Grade**

**Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2017.**

**Pharmacologic Options**

There Are Many Inhaler Devices Available in the US – Choice Is Important

**Manage Stable COPD**

- **Non-pharmacologic**
  - Smoking cessation (can include pharmacologic treatment)
  - Physical activity
  - Flu vaccination
  - Pneumococcal vaccination

- **Smoking cessation (can include pharmacologic treatment)**
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**Inhaled Steroids**

- **ISOLDE**
  - Inhaled corticosteroids (ICS) are indicated for management of severe and very severe COPD (GOLD 2017 Class C/D)
  - Hypothesized to improve lung function, exacerbations, and health status in moderate to severe COPD
  - Findings: fluticasone slows the annual decline in lung function, but did not affect the rate of FEV1 decline
  - FDA-approved dose for COPD is 250 mcg BID
  - 25% reduction in COPD exacerbations in ISOLDE trial
  - No mortality benefit found in ISOLDE trial with fluticasone
  - ICS improves quality of life measures

**Drug class effect is presumed with all ICS’s on the market. Newer molecules have less adverse side effects and toxicity**

**Manage Stable COPD**

- **Non-pharmacologic**
  - Assess and relieve symptoms
  - Individual tools for assessment
  - Improve exercise tolerance
  - Pulmonary rehab

- **Reduce symptoms**
  - Inhaled corticosteroids (ICS)

- **Reduce risk**
  - Prevent and treat exacerbations
  - Reduce mortality

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Inhaled Steroids

- Localized benefits of ICS therapy are now recognized as additive (synergistic) causing up-regulation of beta 2 receptors in the airway, potentiating the bronchodilatory effects of beta agonists.
- Must weigh the benefits of ICS therapy against side effects, such as thrush, pneumonia, osteoporosis, and cataracts.

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.

- TIOSPIR
  - 3-year, event-driven trial comparing the efficacy and safety of the respimat formulation of tiotropium on all-cause mortality.
  - Meta-analysis, since Uplift, with imbalance in numerical death with respimat formulation prompted this large scale study.
  - Tiotropium respimat demonstrated comparable time to COPD exacerbation as the handihaler.
  - Comparable rate of exacerbations, comparable rate of hospitalization.
  - No cardiac events were noted, reinforcing safety in COPD patients with or without cardiac disease.
  - A mortality benefit was found and similar to the handihaler.
  - TIOSPIR solidified the LAMA class as first-line therapy in maintenance of 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/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.

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.
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LABA/LAMA

![Chart showing the annual rate and time to first exacerbation demonstrated superior of the LAMA/LABA over the LABA/ICS](chart_image)

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

Phosphodiesterase 4 (PDE-4)

![Diagram showing the interplay of comorbidities in COPD](diagram_image)

Interplay of Comorbidities in COPD

Comorbidities Negatively Affect Exercise Capacity in COPD

- Associations between 6 minute walk distance in COPD and comorbid diseases in patient with Class 2-4 COPD

Self-management

- Goal of care is to improve patient-related outcomes by augmenting a patient’s self-efficacy to facilitate a lifestyle change
- Social support structurally and functionally enhances self-management through stronger social network interactions
- Exercise therapy and pulmonary rehabilitation are proven interventions that increase self-efficacy in patients with COPD
- However, the results internationally are mixed regarding self-management schemes and decreased healthcare utilization in COPD. Population specific interventions hamper generalizability from the literature
- There are many disease-specific, ecological, socioeconomic, and intra-personal barriers to a successful self-management intervention

Strategies to Improve Self-management and COPD Outcomes

MEDX
MEDICAL EDUCATION EXCHANGE
**Self-care Behaviors**

- A recent study of structural and functional support shows increased pulmonary rehabilitation attendance, smoking cessation, vaccinations, and medication adherence in COPD
- Strong social support led to more steps per day and better quality of life in COPD
- The study conclusions suggest strong social environments can shape successful self care in COPD

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**Provider/Patient Location Elements**

1. Social aspect of intervention: accountability, motivation, sense of belonging to a group
2. Communicating with providers: bidirectional education and support. A patient's need to express what's wrong in real-time and not at their next visit
3. Biosensors/telehealth: heart rate and pulse ox
4. Self-knowledge evolution: self-awareness and perceived benefits

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**Advances in Pulmonary Rehabilitation**

- Exercise training includes: endurance training, strength training, upper-limb training, and transcutaneous neuromuscular electrical stimulation
- Can be home-based
- Exercise training reduces anxiety and depression
- Exercise rehab started during acute or critical illness reduces the extent of functional decline and speeds recovery
- Pulmonary rehab started after a hospitalization (within 4 weeks) for COPD exacerbation is effective, safe, and leads to a reduction in subsequent hospital admissions
- Symptomatic patients with lesser degrees of airflow limitation derive similar benefits as those with severe disease

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**Shared Decision-making**

**AHRQ SHARE**

- Step 1: seek your patient's participation – in a culturally sensitive and clear manner, explain to your patient his current clinical situation and delineate the options available to him. Invite him to be the center of his care team and participate actively in his healthcare.
- Step 2: help your patient explore and compare treatment options – elucidate any benefits and drawbacks to each of his choices and present these in a way to which the patient is most amenable (e.g., writing them down, using pictorial representations). AHRQ recommends employing the teach-back technique here, as well.
- Step 3: assess your patient's values and preferences – gauge what he wants from the interaction and his treatment. This is a significant difference from the conventional approach of years past, where matters most is what is important to the patient and what aligns with his goals and values, rather than what the healthcare system believes he should want.
- Step 4: teach a decision with your patient – engage him throughout his decision making process, which may be immediate or longer. Healthcare providers fulfill an important support role here, ensuring patients and family members are equipped with the information necessary to make an informed decision, while also allowing them the adequate time to arrive at that point.
- Step 5: evaluate your patient's decision – review the decision with the person and follow up to gauge how he is doing on all levels (e.g., emotionally, physically). Engage him to troubleshoot obstacles standing in the way of optimal outcomes.

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**Telehealth Limitations**

- Just as access to centers limits PR attrition, so does access to technology

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**Pulmonary Rehabilitation Decreases Readmissions**

- Physiology of acute COPD exacerbations
  - Decline in quadriceps muscle strength of 5% between day 3 and 8 of hospital admission
  - Quadriceps force continues to decline for up to 3 months after hospital discharge
  - Hospitalized patients spend <10 minutes per day walking and remain inactive for up to 1 month after discharge vs those with stable COPD and similar disease severity

- High re-exacerbation and readmission risk in early recovery phase
- Cochrane Review of 9 in 432 patients
- Pulmonary rehabilitation significantly reduced
  - Hospital admissions (odds ratio 0.22; 95% CI 0.08 to 0.58), NNT=4 (95% CI 3 to 8) over 25 weeks
  - Mortality (OR 0.28; 95% CI 0.10 to 0.84), NNT=4 (95% CI 3 to 8) over 107 weeks

NNT = number needed to treat
Copenhagen City Heart Study

- Moderate physical activity (MET level 3) improves exercise capacity, improves mortality, and decreases COPD admissions

Metabolic Equivalents (METs)

- 1 MET = 3.5cc/kg/min VO2

MET Equivalents for Activity

- Common work-related activities and their estimated oxygen consumption(s)
- More than two-thirds of patients with COPD are under age of 65 and not retired

Physical Activity

Summary

- COPD is a costly, prevalent disease that should be screened in patients at risk and with symptoms suggestive of airflow obstruction
- Recognition of the many endotypes of COPD has improved maintenance management of disease and has led to the development of therapies that improve quality of life, decrease exacerbations, and improve 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

Thank you!