

# COPD: Differential Diagnosis

# Educational Objectives

At the end of this presentation, the learner should be able to ...

- Describe constellation of symptoms and evaluation leading to consideration of chronic obstructive pulmonary disease (COPD) as diagnosis.
- Delineate modifiable and non-modifiable risk factors for chronic obstructive pulmonary disease.
- Understand diagnostic criteria for COPD.
- Describe other diseases that need to be considered in the workup of a patient with dyspnea, chronic cough, and sputum production.

# Differential Diagnosis

- Evaluation
- Risk Factors
- Diagnostic Criteria
- Other Conditions to Consider

# Evaluation

## Assessment of symptoms

- Severity of breathlessness, cough, sputum production, wheezing, chest tightness, weight loss or anorexia
- Change in alertness or mental status, fatigue, confusion, anxiety, dizziness, pallor or cyanosis
- COPD should be considered in any patient with a chronic cough, dyspnea or sputum production

# Evaluation

## Assessment of symptoms

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# Evaluation

## Medical History

- Allergies
- Sinus problems
- Other respiratory disease
- Risk factors
- Exposures (occupational and environmental)
- Family history
- Co-morbidities that may affect activity
- Medications
- Prior hospitalizations or evaluation to date

Global Initiative for Chronic Obstructive Lung Disease (GOLD), 2009

# Evaluations

- Vital Signs
  - Respiratory rate, pattern, effort
  - Pulse oximetry
- Extremities
  - Inspection for cyanosis
- Chest
  - Inspection to assess AP diameter (barrel chest)
  - Palpation and percussion of chest
- Lungs
  - Auscultation for wheezing, crackles, and/or decreased breath sounds

# Question

The differential diagnosis of COPD should be considered in patients who present with which of the following symptoms?

- A. Chronic cough
- B. Any sputum production
- C. Dyspnea
- D. Increased sputum production
- E. All of the above



# Differential Diagnoses

## **Pulmonary**

- Asthma
- Bronchogenic carcinoma
- Bronchiectasis
- Tuberculosis
- Cystic fibrosis
- Interstitial lung disease
- Bronchiolitis obliterans
- Alpha-1 antitrypsin deficiency
- Pleural effusion
- Pulmonary edema
- Recurrent aspiration
- Tracheobronchomalacia
- Recurrent pulmonary emboli
- Foreign body

## **Non-pulmonary**

- Congestive Heart Failure
- Hyperventilation syndrome/panic attacks
- Vocal cord dysfunction
- Obstructive sleep apnea – undiagnosed
- Aspergillosis
- Chronic Fatigue Syndrome

# Question

Which of the following is the most appropriate to use to confirm the diagnosis of COPD?

- A. Chest X-ray
- B. Arterial blood gas
- C. Spirometry
- D. High resolution CT scan of chest
- E. Clinical examination

# Evaluation

Studies that may help in diagnosis:

- Chest X-ray (SOR: C)
- Spirometry (SOR: C)
- Arterial blood gas (SOR: C)
- Alpha-1 antitrypsin levels (SOR: C)
- High resolution CAT scan of chest (SOR: C)

SOR: Strength of Recommendation

Stephens, 2008

# Evaluation

## Spirometry

- Gold standard for diagnosis
- Standard to establish severity and stage
- Perform both pre- and post-bronchodilator
  - Irreversible airflow limitation is the hallmark of COPD

# Risk Factors

- Smoking
  - Major risk factor (duh!)
  - Risk increases with number of pack years smoked
  - Secondhand smoke in large amounts presents risk
- Environmental pollution
  - Smog and exhaust from vehicles
  - Smoke from burning wood or other biomass fuels
  - Particulates in occupational dust

# Risk Factors

## **Occupational Irritants**

### Occupation

Agricultural worker

Coal miner

Concrete worker

Construction worker

Gold miner

Hard rock miner

Rubber worker

### Irritant

Endotoxin

Coal dust

Mineral dust

Dust

Silica

Mineral dust

Industrial chemicals

# Risk Factors

## Nonmodifiable Risk Factors

- Gender (Risk about equal in men and women)
  - Attributed to smoking habits of both genders
- Age
  - Develops slowly
  - Most people  $\geq 40$  years old when symptoms start
- Alpha-1 antitrypsin deficiency
  - Mostly Northern European heritage
  - Rare cause (2% of COPD population)

Global Initiative for Chronic Obstructive Lung Disease (GOLD), 2009

# Risk Factors

## Additional risk factors

- Severe lung infections as a child
- Previous tuberculosis
- Gastroesophageal reflux disease
  - Possible cause as recurrent irritant
  - May worsen COPD
- Lower socioeconomic status



# Diagnostic Criteria

## Global Initiative for Chronic Obstructive Lung Disease (GOLD) Criteria

- Program to provide guidelines for management of COPD; started 1998; international effort.
- Consider COPD in any patient with following:
  - Dyspnea
  - Chronic cough or sputum production and/or
  - Exposure to risk factors

# Diagnostic Criteria

## GOLD Criteria (continued)

- Symptoms and risk factors are not diagnostic in themselves but should prompt spirometry in patients >40 yrs of age
- Diagnosis should be confirmed by pre- and post-bronchodilator spirometry

# Diagnostic Criteria

## Key Indicators

- Dyspnea
  - Progressive, usually worse with exercise, persistent, described as increased effort to breathe
- Chronic cough
  - May be intermittent, may be nonproductive
- Chronic sputum production
  - Any pattern
- History of exposure to risk factors
  - Tobacco smoke, occupational dust, chemicals, fumes or smoke from cooking or heating fuels

# Spirometry Classification for COPD

Stage	FEV1:FVC	FEV1
1: Mild	<0.70	≥80% of predicted value
2: Moderate		50% to 79% of predicted value
3: Severe		30% to 49% of predicted value
4: Very severe		<30% of predicted value OR <50% of predicted value with chronic respiratory failure

Adapted from GOLD, 2009

# Differential Diagnoses

## **Pulmonary**

- **Asthma**
- Bronchogenic carcinoma
- **Bronchiectasis**
- **Tuberculosis**
- **Cystic fibrosis**
- Interstitial lung disease
- **Bronchiolitis obliterans**
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- Pleural effusion
- Pulmonary edema
- Recurrent aspiration
- **Tracheobronchomalacia**
- Recurrent pulmonary emboli
- Foreign body

## **Non-pulmonary**

- **Congestive heart failure**
- Hyperventilation syndrome/panic attacks
- Vocal cord dysfunction
- Obstructive sleep apnea (undiagnosed)
- Aspergillosis
- Chronic fatigue syndrome

Stephens, 2008

# Diagnostic Criteria

## Asthma

- Episodic symptoms of airflow obstruction or airway hyper-responsiveness
- Airflow obstruction partially reversible by spirometry
- Characterized by reversibility and variability in symptoms and airflow
- Alternative diagnosis excluded by history and exam

# Diagnostic Criteria

## Asthma – Key indicators

- Cough, worse particularly at night
- Recurrent wheezing, chest tightness or difficulty breathing
- Wheezing on physical examination
- Symptoms that occur or worsen in presence of known triggers
- Symptoms that occur/worsen at night

Adapted from NHLBI/NIH NAEP Guidelines, 2007

# Diagnostic Criteria

## Asthma – Spirometry

- Establishes diagnosis of asthma
- Perform when key indicators present
- Demonstrates obstruction and assesses for reversibility
  - Reversibility defined as  $>12\%$  increase in FEV1 from baseline



# Diagnostic Criteria

## Asthma – Similarities with COPD

- Major epidemiologic causes of chronic obstructive airway disease
- Involve underlying airway inflammation
- Can cause similar chronic respiratory symptoms and fixed airflow limitation
- Can co-exist with the other making diagnosis more difficult

Global Initiative for Chronic Obstructive Lung Disease (GOLD), 2009  
Global Initiative for Asthma (GINA) Report, 2009

# Diagnostic Criteria

## Asthma – Differences from COPD

- Underlying immune mechanism of chronic inflammation different
- Age of onset
  - Earlier in life with asthma
  - Usually > age 40 in COPD
- Symptoms in asthma vary; COPD slowly progressive
- Smoking associated with COPD
- Asthma with reversible airflow limitation; irreversible airflow limitation in COPD

Global Initiative for Chronic Obstructive Lung Disease (GOLD), 2009

# Diagnostic Criteria

Asthma –

Using spirometry to differentiate from COPD

- Post-bronchodilator FEV1 <80% predicted together with FEV1/FVC <0.70 confirms airflow limitation that is not fully reversible
- Asthma may show similar changes in chronic and more severe cases; PFT's may be needed to distinguish it from COPD

# Clinical Features in Differentiating COPD from Asthma

<b>Clinical Feature</b>	<b>COPD</b>	<b>Asthma</b>
<b>Age</b>	Older than 35 years	Any age
<b>Cough</b>	Persistent, productive	Intermittent, usually nonproductive
<b>Smoking</b>	Typical	Variable
<b>Dyspnea</b>	Progressive, persistent	Variable
<b>Nocturnal symptoms</b>	Breathlessness, late in disease	Coughing, wheezing

Adapted with permission from Stephens, 2008

# Clinical Features in Differentiating COPD from Asthma (continued)

<b>Clinical Feature</b>	<b>COPD</b>	<b>Asthma</b>
<b>Family history</b>	Less common	More common
<b>Atopy</b>	Less common	More common
<b>Diurnal symptoms</b>	Less common	More common
<b>Spirometry</b>	Irreversible airway limitation	Reversible airway limitation

Adapted with permission from Stephens, 2008

# Diagnostic Criteria

## Heart Failure (HF)

Characteristics	Midlife to late-life onset; associated with risk factors such as hypertension and coronary artery disease
Clinical presentation	Fatigue, exertional and paroxysmal nocturnal dyspnea, and peripheral edema, crackles on auscultation
Pulmonary function test	Decreased DLCO, predominantly used to exclude other diagnoses

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# Diagnostic Criteria

## Heart Failure (HF, continued)

Chest radiography	Increased heart size, pulmonary vascular congestion, pleural effusions
Other recommended testing	Echocardiography, BNP measurement, electrocardiography; cardiac catheterization in selected patients

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# Diagnostic Criteria

## Bronchiectasis

Characteristics	Usually midlife onset; progressive with exacerbations
Clinical presentation	Productive cough with large volumes of thick, purulent sputum; dyspnea; and wheezing associated with bacterial infections, crackles, and clubbing on exam
Pulmonary function test	Obstructive airflow limitation, both fixed and reversible

Adapted with permission from DeWar, 2006  
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# Diagnostic Criteria

## **Bronchiectasis (continued)**

Chest radiography	Focal pneumonia, atelectasis; dilated bronchial tree, thickened airways (ring shadow)
Other recommended testing	Bacterial, microbacterial, and fungal sputum culture, chest CT.

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# Diagnostic Criteria

<b>Tuberculosis</b>	
Characteristics	Onset at any age; associated with history of exposure, local prevalence may suggest diagnosis
Clinical presentation	Productive cough, hemoptysis, fever, and weight loss
Pulmonary function test	Not used for diagnosis

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# Diagnostic Criteria

## **Tuberculosis (continued)**

Chest radiography	Infiltrate, nodular lesions, hilar adenopathy, cavitary lesions or granulomas
Other recommended testing	Sputum AFB culture, PPD, sputum cultures confirm diagnosis

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# Diagnostic Criteria

## **Bronchiolitis obliterans**

Characteristics	Onset at any age but often younger; may be associated with history of flu-like illness, collagen vascular disease, or toxic fume exposure, non-smokers
Clinical presentation	Often subacute presentation with dyspnea, cough, and fever
Pulmonary function test	Decreased vital capacity, decreased DLCO, usually no obstructive component

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# Diagnostic Criteria

## **Bronchiolitis obliterans (continued)**

Chest radiography	Multifocal, bilateral alveolar infiltrates
Other recommended testing	ESR, high-resolution CT shows hypodense areas, lung biopsy

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# Diagnostic Criteria

## Tracheobronchomalacia

Characteristics	Onset usually more middle age; idiopathic or acquired during the course of other illnesses
Clinical presentation	Cough, difficulty in clearing secretions, wheezing, recurrent bronchitis, pneumonia
Pulmonary function test	Obstructive ventilatory impairment not responsive to conventional treatment with bronchodilators or inhaled corticosteroids

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# Diagnostic Criteria

## Tracheobronchomalacia, (continued)

Chest radiography (dynamic CT)	Allows volumetric acquisition of data both at end-inspiration and during dynamic expiration; reduction in airway caliber of 50% or more between inspiration and expiration may help in diagnosis
Other recommended testing	Flexible bronchoscopy; endobronchial ultrasonography

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# Diagnostic Criteria

## **Cystic fibrosis**

Characteristics	Usually early-life onset; progressive with exacerbations; associated with pancreatic disease, failure to thrive, intestinal obstruction, cirrhosis, and steatorrhea.
Clinical presentation	Predictive cough with purulent sputum, dyspnea, and wheezing
Pulmonary function test	Predominantly fixed airflow obstruction

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# Diagnostic Criteria

## **Cystic fibrosis (continued)**

Chest radiography	Bronchiectasis frequent in upper lobes
Other recommended testing	Sweat chloride test (diagnostic), bacterial sputum culture

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# Key Points

- COPD is associated with several chronic respiratory symptoms that suggests its diagnosis
- Symptoms overlap with other conditions -- asthma in particular
- History, risk factors and progression of disease assist with diagnosis
- Spirometry, with and without bronchodilator, usually necessary to make diagnosis

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