COPD and asthma: Diagnostic accuracy requires spirometry

Up to one-third of patients receiving a clinical diagnosis of COPD or asthma have been shown to lack evidence of disease in subsequent lung-function studies.

A study of diagnostic accuracy in the primary care setting showed that among patients receiving inhaled therapies, most had not received an accurate diagnosis of chronic obstructive pulmonary disease (COPD) or asthma according to international guidelines. Other studies have shown that up to one-third of patients with a diagnosis of asthma or COPD may not actually have disease based on subsequent lung function testing.

Diagnostic error in medicine leads to numerous lost opportunities including the opportunity to: identify chronic conditions that are the true sources of patients’ symptoms, prevent morbidity and mortality, reduce unnecessary costs to patients and health systems, and deliver high-quality care. The reasons for diagnostic error in COPD and asthma are multifactorial, stemming from insufficient knowledge of clinical practice guidelines and underutilization of spirometry testing. Spirometry is recommended as part of the workup for suspected COPD and is the preferred test for diagnosing asthma. Spirometry, combined with clinical findings, can help differentiate between these diseases.

In this article, we review the definitions and characteristics of COPD and asthma, address the potential causes for diagnostic error, and explain how current clinical practice guidelines can steer examinations to the right diagnosis, improve clinical management, and contribute to better patient outcomes and quality of life.

COPD and asthma characteristics

COPD. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) defines COPD as a common lung disease characterized by persistent respiratory symptoms and airflow obstruction caused by airway or alveolar abnormalities secondary to significant exposure to noxious particles or gases. The most common COPD-risk exposure in the United States...
is tobacco smoke, chiefly from cigarettes. Risk is also heightened with use of other types of tobacco (pipe, cigar, water pipe), indoor and outdoor air pollution (including second-hand tobacco smoke exposure), and occupational exposures. (Consider testing for alpha-1 antitrypsin deficiency—a known genetic risk factor for COPD—especially when an individual with COPD is younger and has a limited smoking history.)

The most common symptom of COPD is chronic, progressive dyspnea — an increased effort to breathe, with chest heaviness, air hunger, or gasping. About one-third of people with COPD have a chronic cough with sputum production.10 There may be wheezing and chest tightness. Fatigue, weight loss, and anorexia can be seen in severe COPD. Consider this disorder in any individual older than 40 years of age who has dyspnea and chronic cough with sputum production, as well as a history of risk factors. If COPD is suspected, perform spirometry to determine the presence of fixed airflow limitation and confirm the diagnosis.

**Asthma** is usually characterized by variable airway hyperresponsiveness and chronic inflammation. A typical clinical presentation is an individual with a history of wheezing, shortness of breath, chest tightness, and cough that vary in intensity over time and are coupled with variable expiratory flow limitation. Asthma symptoms are often triggered by allergen or irritant exposure, exercise, weather changes, or viral respiratory infections.2 Symptoms may also be worse at night or first thing in the morning. Once asthma is suspected, document the presence of airflow variability with spirometry to confirm the diagnosis.

**Diagnostic error in suspected COPD and asthma**

Numerous studies have demonstrated the prevalence of diagnostic error when testing of lung function is neglected.11-14 Using spirometry to confirm a prior clinical diagnosis of COPD, researchers found that:

- 35% to 50% of patients did not have objective evidence of COPD12,13;
- 37% with an asthma-only diagnosis had persistent obstruction, which may indicate COPD or chronic obstructive asthma12; and
• 31% of patients thought to have asthma-COPD overlap did not have a COPD component.12

In 2 longitudinal studies, patients with a diagnosis of asthma were recruited to undergo medication reduction and serial lung function testing. Asthma was excluded in approximately 30% of patients.15,16 Diagnostic error has also been seen in patients hospitalized with exacerbations of COPD and asthma. One study found that only 31% of patients admitted with a diagnosis of COPD exacerbation had undergone a spirometry test prior to hospitalization.17 And of those patients with a diagnosis of COPD who underwent spirometry, 30% had results inconsistent with COPD.17

In another study, 22% of adults hospitalized for COPD or asthma exacerbations had no evidence of obstruction on spirometry at the time of hospitalization.18 This finding refutes a diagnosis of COPD and, in the midst of an exacerbation, challenges an asthma diagnosis as well. Increased awareness of clinical practice guidelines, coupled with the use and accurate interpretation of spirometry are needed for optimal management and treatment of COPD and asthma.

Airflow measurement is decisive in diagnosing COPD and asthma
Clinical practice guidelines recommend spirometry for the diagnosis of COPD and asthma and have been issued by GOLD10; the American College of Physicians, American College of Chest Physicians, American Thoracic Society, and the European Respiratory Society19; the Global Initiative for Asthma (GINA)2; and the National Heart, Lung, and Blood Institute.20

When a patient’s symptoms and risk factors suggest COPD, spirometry is needed to show persistent post-bronchodilator airflow obstruction and thereby confirm the diagnosis. However, in the United States, confirmatory spirometry is used only in about one third of patients newly diagnosed with COPD.21,22 Similarly for asthma, in the presence of suggestive symptoms, spirometry is the preferred and most reliable and reproducible test to detect the variable expiratory airflow limitation consistent with this diagnosis.

An alternative to spirometry for the diagnosis of asthma (if needed) is a peak flow meter, a simple tool to measure peak expiratory flow. When compared with spirometry, peak flow measurements are less time consuming, less costly, and not dependent on trained staff to perform.23 However, this option does require that patients perform and document multiple measurements over several days without an objective assessment of their efforts. Unlike spirometry, the peak flow meter has no reference values or reliability and reproducibility standards, and measurements can differ from one peak flow meter to another. Thus, a peak flow meter is less reliable than spirometry for diagnosing asthma. But it can be useful for monitoring asthma control at home and in the clinic setting,24 or for diagnosis if spirometry is unavailable.23

Barriers to the use of spirometry in the primary care setting exist on several levels. Providers may lack knowledge of clinical practice guidelines that recommend spirometry in the diagnosis of COPD, and they may lack general awareness of the utility of spirometry.25-29 In 2 studies of primary care practices that offered office spirometry, lack of knowledge in conducting and interpreting the test was a barrier to its use.28,30 Primary care physicians also struggle with logistical challenges when clinical visits last just 10 to 15 minutes for patients with multiple comorbidities,27 and maintenance of an office spirometry program may not always be feasible.

Getting to the right diagnosis
Guideline-based treatment recommendations differ for COPD and asthma, and mistakenly treating the wrong condition can lead to adverse events (AEs). For instance, while inhaled corticosteroids use is common in patients with persistent asthma, its use in COPD increases the risk of pneumonia31 and thus is usually reserved for add-on treatment mainly if patients experience continued exacerbations. Use of long-acting beta-agonists (LABAs) as monotherapy is ap-
Asthma was excluded in about 30% of patients studied longitudinally who subsequently underwent spirometry.
In a large Canadian study, the approach that most strongly predicted poor patient outcomes was using a FEV1/FVC based on fixed (70%) and/or LLN criteria, and a low FEV\textsubscript{1}\textsuperscript{34}

Spirometry findings with asthma. According to the American Thoracic Society, a post-bronchodilator response is defined as an increase in FEV\textsubscript{1} (or FVC) of 12% if that volume is also ≥200 mL. In patients with suspected asthma, an increase in FEV\textsubscript{1} ≥12% and 200 mL is consistent with variable airflow limitation\textsuperscript{2} and supports the diagnosis. Of note, lung function in patients with asthma may be normal when patients are not symptomatic or when they are receiving therapy. Spirometry is therefore ideally performed before initiating therapy and when maintenance therapy is being considered due to symptoms. If therapy is clinically indicated, a short-acting bronchodilator may be prescribed alone and then held 6 to 8 hours before conducting spirometry. If a trial of a maintenance medication is prescribed before spirometry, consider de-escalation of therapy once the patient is more stable and then perform spirometry to confirm the presence of airflow variability consistent with asthma. (In COPD, there can be a positive bronchodilator response; however, the post-bronchodilator FEV\textsubscript{1}/FVC ratio remains low.)

Don't use in isolation. Use spirometry to support a clinical suspicion of asthma\textsuperscript{36} or COPD after a thorough history and physical exam, and not in isolation.

Special consideration: Asthma-COPD overlap syndrome
Some patients have features characteristic of both asthma and COPD and are said to have asthma-COPD overlap syndrome (ACOS). Between 15% and 20% of patients with COPD may in fact have ACOS.\textsuperscript{36} While there is no specific definition of ACOS, GOLD and GINA describe ACOS as persistent airflow limitation with several features usually associated with asthma and several features usually associated with COPD.\textsuperscript{2,10,37} ACOS becomes more prevalent with advancing age.

In ACOS, patients with COPD present with increased reversibility or patients with asthma and smoking history develop non-fully reversible airway obstruction at an older age.\textsuperscript{38} Patients with ACOS have worse lung function, more respiratory symptoms, and lower health-related quality of life than individuals with asthma or COPD alone,\textsuperscript{39,40} leading to more consumption of medical resources.\textsuperscript{41} In patients with ACOS, the FEV\textsubscript{1}/FVC ratio is low and consistent with the diagnosis of COPD. The post-bronchodilator response may be variable, depending on the stage of disease and predominant clinical features. It is still unclear whether ACOS is a separate disease entity, a representation of severe asthma that has morphed into COPD, or not a syndrome but simply 2 separate co-morbid disease states.

**TABLE**
Common clinical and spirometric features of COPD and asthma\textsuperscript{2,10,34}

<table>
<thead>
<tr>
<th>COPD</th>
<th>Asthma</th>
</tr>
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<tbody>
<tr>
<td><strong>Age of onset</strong></td>
<td>Usually &gt;40 years</td>
</tr>
<tr>
<td><strong>Respiratory symptoms</strong></td>
<td>Chronic dyspnea, cough or phlegm with good and bad days</td>
</tr>
<tr>
<td><strong>Treatment response</strong></td>
<td>Symptoms may progress despite treatment</td>
</tr>
<tr>
<td><strong>Spirometry</strong></td>
<td>Post-bronchodilator FEV\textsubscript{1}/FVC &lt;70%, or &lt;LLN</td>
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</tbody>
</table>

COPD, chronic obstructive pulmonary disease; FEV\textsubscript{1}, forced expiratory volume in 1 second; FVC, forced vital capacity; LLN, lower limit of normal.
References


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