Primary care physicians routinely see patients with chronic respiratory diseases, such as asthma and chronic obstructive pulmonary disease (COPD). Although treatment guidelines are available, we still need practical information that translates guidelines and other evidence into diagnosing and managing these diseases. Each issue in the Pulmonary Practice Pearls for Primary Care Physicians eNewsletter series will focus on a key topic in the management of COPD or asthma within the context of current national guidelines and clinical practice. Topics will be brought to life through the presentation of clinical cases, and an emphasis will be placed on applying key learnings to clinical practice.

**Screening for COPD in Primary Care**

COPD is characterized by chronic, often progressive airflow limitation that is not fully reversible and is associated with extrapulmonary conditions as described in the first newsletter in this series. In the United States in 2008, an estimated 12 million adults had COPD. However, COPD is often under-recognized and underdiagnosed. Individuals with mild COPD may not have symptoms, may not perceive symptoms to be abnormal (eg, chronic cough, sputum production), or may adapt their lifestyles during onset of slowly progressive symptoms.

Screening or case finding tools can be used to identify patients with symptoms that may be indicative of COPD, but which they may not recognize as abnormal. COPD develops frequently in middle-aged longtime smokers. In 1 study of current and former smokers aged ≥40 years from a single primary care practice in the United States or United Kingdom, 18.9% of these patients had undiagnosed COPD, a result consistent with other similar studies. Findings from a multicenter primary care US study of 1283 current or ex-smokers aged >40 years with self-reported bronchitis symptoms showed that 74% of patients reported dyspnea and 26% exhibited airflow obstruction consistent with COPD.

A diagnosis of COPD should be considered in any patient aged ≥40 years with symptoms of progressive or persistent dyspnea, chronic cough, or chronic sputum production, or a history of exposure to risk factors, such as tobacco smoke. A need to decrease activities due to dyspnea or fatigue may also be suggestive of COPD. A diagnosis of COPD is confirmed using spirometry, based primarily on a postbronchodilator ratio of forced expiratory volume in 1 second (FEV₁) to forced vital capacity (FVC) <0.70. The calculation of the ratio is based on actual values of FEV₁ and FVC measured in liters, and not on a ratio of the percentage predicted values. A postbronchodilator FEV₁/FVC ratio <0.70 confirms the presence of airflow limitation that is not fully reversible.
Disease severity is further classified by FEV₁ measurement: mild, ≥80% predicted; moderate, 50% to <80% predicted; severe, 30% to <50% predicted; and very severe, <30% predicted.¹,⁶ Patients with mild COPD are often asymptomatic, unaware that their lung function is limited; these patients are often undiagnosed and untreated.¹ It is unclear whether these patients benefit from regular pharmacologic treatment. Regardless of symptoms or disease stage, all smokers should be offered smoking cessation intervention.¹

**Guidelines for Screening**

According to current clinical guidelines of the US Preventive Services Task Force (USPSTF) published in 2008, healthy adults who do not report respiratory symptoms to a clinician should not be screened for COPD using spirometry.⁷ Spirometry is indicated as a diagnostic test for patients with symptoms suggestive of COPD, asthma, or other respiratory diseases (eg, chronic cough, increased sputum production, wheezing, dyspnea).¹,⁷,⁸ The American College of Physicians offers guidance similar to that advocated by the USPSTF.⁹ In contrast, the Global Initiative for Chronic Obstructive Lung Disease (GOLD) and the American Thoracic Society (ATS) suggest that in addition to symptomatic patients, diagnostic spirometry be considered in any patient⁶ or those >40 years of age¹ with a history of exposure to risk factors, such as tobacco smoke. A smoking history of ≥20 pack-years has been shown to be a particularly strong predictor of airway obstruction (adjusted odds ratio, 3.59), whereas symptoms of wheeze, cough, sputum, or dyspnea are weaker predictors.¹⁰

The USPSTF, GOLD, and ATS recommend that all patients are screened for tobacco use and are counseled to quit.¹,⁶,⁷ Treatment of tobacco dependence should be considered a primary and specific intervention⁶; smokers should be advised to quit, regardless of consideration of a COPD diagnosis. However, smoking cessation is often the most effective intervention to reduce risk of COPD and to halt progression of existing disease.¹

**Improving Detection in Primary Care**

Many patients do not recognize COPD symptoms as abnormal or worth reporting, and physicians seldom ask about respiratory symptoms in patients without a respiratory history unless these are part of their chief complaint. By using screening tools, physicians can help patients recognize that their symptoms are not from being overweight, old, or out of shape, but from a disease. Patients who fail screening can then be recommended for diagnostic spirometry. Recent findings from placebo-controlled trials have shown that treatment with an inhaled corticosteroid and long-acting β₂-adrenergic agonist or a long-acting anticholinergic can slow decline in pulmonary function, reduce exacerbations, and improve health status of patients with moderate disease¹¹,¹² (ie, GOLD stage II¹; GOLD disease stages are reviewed in the first newsletter in this series). Studies also have shown that diagnosis of airflow limitation may correlate with increased rates of smoking cessation.¹³,¹⁴

**Questionnaires**

To help identify patients at increased risk of obstructive airway disease, questionnaires based on important symptoms, age, and smoking history have been developed. These questionnaires may help patients report important symptoms, and they have been shown to have reasonable sensitivity and specificity for COPD when used in the general population.¹⁵,¹⁶ The screening tools identify patients who require further clinical evaluation and diagnostic spirometry.¹⁵,¹⁶ It is hoped that regular use of questionnaires might improve awareness of disease and lead to earlier symptom recognition.¹⁵,¹⁶ The 5- to 7-item questionnaires are completed by patients and simple to score, making them practical for use in primary care.¹⁵,¹⁶
The COPD Population Screener Questionnaire (COPD-PS) was developed by pulmonary specialists, primary care physicians, and a respiratory therapy professor. This 5-item questionnaire (Table 1) was validated in 295 patients ≥35 years of age with no acute respiratory problems who sought care at pulmonary specialist and general practice sites. Responses are assigned a value of 0, 1, or 2, based on the relative contribution of each item to identification of airway obstruction. Total scores range from 0 to 10, with a score ≥5 indicative of airway obstruction.

### Hypothetical Case Description: Using the COPD Population Screener Questionnaire

Marilyn is a 66-year-old former smoker who presents with fatigue. After a heart attack 6 months ago, she quit smoking, lost 30 pounds, and finished cardiac rehabilitation. Her cardiologist tells her that she is in great shape and that her blood pressure, blood sugar, and cholesterol numbers are normal. However, she is very discouraged; everyone tells her she looks 10 years younger, but she feels old.

Upon further evaluation, Marilyn admits that she tires easily when shopping, walking with her dog, or playing with her grandchildren. She does not have chest tightness, but it is difficult for her to breathe when she gets tired.

Marilyn has never had a breathing test. Her COPD-Population Screener score is 8, which is elevated and suggests that she is at increased risk of having COPD. Her physician proceeds to pre- and postbronchodilator spirometry and diagnoses moderate COPD.

Note: This is a hypothetical case description for teaching purposes.

The Lung Function Questionnaire (LFQ) (Table 2), designed for use in the primary care setting, was developed and validated in a subset of 387 patients ≥40 years of age with a self-reported diagnosis of chronic bronchitis on the third National Health and Nutrition Examination Survey. Answers to questions regarding age, smoking history, wheeze, dyspnea, and phlegm are scored as binary variables. During initial validation, a score ≥3 on the LFQ scale suggested a risk of airflow obstruction.

### Hypothetical Case Description: Using the Lung Function Questionnaire

Jonathan is a 48-year-old construction worker. He visits his family physician because he cannot keep pace with teammates on his recreational basketball team. He can hardly run a few lengths of the basketball court without having to slow down or stop. His wife, who has come with him, fears that he will revert to a smoking habit that he quit last year if he cannot play basketball to relieve stress.

Jonathan admits to being discouraged. He has become the foreman at work and does not think he can keep up on the job. He gets short of breath when climbing stairs or carrying tools, and still complains about his smoker’s cough.

Jonathan’s LFQ score is elevated (6). His physician proceeds to pre- and postbronchodilator spirometry assessment, and diagnoses moderate COPD.
**Pocket Spirometers**

Measurement of FEV₁ with an inexpensive pocket spirometer is an alternative method for early detection of COPD and may simplify the technical issues of spirometry use in primary care. Most pocket spirometers provide FEV₁ measurements that are comparable to those of standard diagnostic spirometers. In 1 pilot study, FEV₁ measured with a handheld microspirometer showed good correlation with that obtained with full spirometry in a pilot study of patients with normal lung function (n=32; r=0.965; P<.0001) and a subset of patients with a history of smoking, no previously diagnosed lung disease, and FEV₁ <80% predicted normal (n=50; r=0.87; P<.001). Measurements for FVC are less reproducible with portable devices when compared with standard spirometry. However, differences in lung function measures for pocket spirometers compared with conventional spirometers are unlikely to be clinically relevant, especially when these devices are being used for screening or case finding. Pocket spirometers available in the United States are listed in Table 3. These devices also are referred to as electronic flow meters with FEV₁.

**Additional Considerations for Use of COPD Screening Tools**

Both previous cases involve patients with long smoking histories. Remember that similar symptoms and findings may occur in patients with work-related exposure to inhaled toxins. These may include individuals in occupations as varied as baker, carpenter, and bartender, inhaling flour, sawdust, and secondhand smoke, respectively. When symptomatic, these patients also deserve to be screened for COPD. A handheld spirometer may be a better method of assessment in nonsmokers, because the COPD-PS and LFQ include questions specific to smoking habits.

**Use of Questionnaires With Pocket Spirometry**

Combined use of COPD screening questionnaires and pocket spirometers may further facilitate the identification of patients at risk for COPD in primary care. Worldwide (Burden of Obstructive Lung Disease [BOLD] Initiative) and Latin American (Latin American Project for the Investigation of Obstructive Lung Disease [PLATINO]) studies of COPD prevalence and associated risk factors in adults aged ≥40 years have incorporated portable spirometers and questionnaires into their study designs to assess both airflow limitation and symptoms. Future studies may take advantage of small, inexpensive pocket spirometers to screen for airflow limitation conveniently. Use of pocket spirometers in conjunction with questionnaires in clinical practice might lower the false-positive rates of patient identification associated with either tool individually, and result in targeted use of full spirometry evaluation for patients at highest risk for COPD.

**Conclusion**

The COPD-PS and LFQ questionnaires and pocket spirometers are convenient tools to help physicians identify patients who potentially have or are at risk for COPD. A sample algorithm for using these tools to screen patients for COPD is presented in the Figure. Importantly, these are not diagnostic tools; full pre- and postbronchodilator spirometry conducted according to established guidelines is needed to confirm a diagnosis of COPD and help
exclude other differential diagnoses. Patients should also be referred to specialists if their family physicians have questions regarding COPD diagnosis or disease management.

**References**


**Table 1. COPD Population Screener Questionnaire (COPD-PS)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Response</th>
<th>Item-Response Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the past 4 weeks, how much of the time did you feel short of breath?</td>
<td>None of the time&lt;br&gt;A little of the time&lt;br&gt;Some of the time&lt;br&gt;Most of the time&lt;br&gt;All of the time</td>
<td>0&lt;br&gt;0&lt;br&gt;1&lt;br&gt;2&lt;br&gt;2</td>
</tr>
<tr>
<td>Do you ever cough up any “stuff,” such as mucus or phlegm?</td>
<td>No, never&lt;br&gt;Occasionally colds&lt;br&gt;Few days a month&lt;br&gt;Most days a week&lt;br&gt;Yes, every day</td>
<td>0&lt;br&gt;0&lt;br&gt;1&lt;br&gt;1&lt;br&gt;2</td>
</tr>
<tr>
<td>Please select the answer that best describes you in the past 12 months. “I do less than I used to because of my breathing problems.”</td>
<td>Strongly disagree&lt;br&gt;Disagree&lt;br&gt;Unsure&lt;br&gt;Agree&lt;br&gt;Strongly agree</td>
<td>0&lt;br&gt;0&lt;br&gt;0&lt;br&gt;1&lt;br&gt;2</td>
</tr>
<tr>
<td>Have you smoked at least 100 cigarettes in your ENTIRE LIFE?</td>
<td>No&lt;br&gt;Yes</td>
<td>0&lt;br&gt;2</td>
</tr>
<tr>
<td>How old are you?</td>
<td>35 to 49 years&lt;br&gt;50 to 59 years&lt;br&gt;60 to 69 years&lt;br&gt;70+ years</td>
<td>0&lt;br&gt;1&lt;br&gt;2&lt;br&gt;2</td>
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</tbody>
</table>
A total score $\geq 5$ suggests airway obstruction.


<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
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<tbody>
<tr>
<td>What is your age range?</td>
<td></td>
</tr>
<tr>
<td>$\geq 50$ years</td>
<td>1</td>
</tr>
<tr>
<td>$&lt;50$ years</td>
<td>0</td>
</tr>
<tr>
<td>Does your chest often sound noisy (wheezy, whistling) when you breathe?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Do you experience shortness of breath upon physical exertion (walking up a flight of stairs or walking up an incline without stopping to rest)?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Do you frequently cough up mucus?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>How many years have you smoked?</td>
<td></td>
</tr>
<tr>
<td>$\geq 20$ years</td>
<td>1</td>
</tr>
<tr>
<td>$&lt;20$ years</td>
<td>0</td>
</tr>
</tbody>
</table>
A total score $\geq 3$ suggests risk of airflow obstruction.


### Table 3. Examples of pocket spirometers available in the United States

<table>
<thead>
<tr>
<th>Model</th>
<th>Manufacturer</th>
<th>Parameters</th>
<th>Features</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>copd-6™</td>
<td>Vitalograph™</td>
<td>FEV₁, FEV₁/FEV₆</td>
<td>Airflow spins a turbine vane; measures FEV₁, FEV₆, FEV₁/FEV₆ and % pred (ERS 1993 or NHANES III race-specific references); quality messages for high BEV, cough, FET $&lt;$ 3 s, and EOTV $&lt;$ 25 mL; color zones for COPD (based on % pred FEV₁); lung age, 2 AAA batteries; and uses standard disposable 1-way mouthpieces</td>
<td><a href="http://www.vitalograph.com">www.vitalograph.com</a></td>
</tr>
<tr>
<td>PEF100™</td>
<td>Microlife™</td>
<td>FEV₁, PEF</td>
<td>Airflow spins a propeller; 240 numeric results stored (with date and time); color zones for asthma; USB connector for optional computer software and optional printer; 2 AA batteries. This model would require an inexpensive rubber adaptor to use disposable 1-way mouthpieces (not available from the manufacturer)</td>
<td><a href="http://www.microlifeusa.com">www.microlifeusa.com</a></td>
</tr>
<tr>
<td>PiKo-1™</td>
<td>nSpire™</td>
<td>FEV₁, PEF</td>
<td>Airflow bends a vane; 96 numeric results stored (with date and time); error messages for cough and FET $&lt;$ 1 s; color zones for asthma; infrared connection for optional USB cradle for PC-based PiKoNET software; 2 type-357 button cells. A mouthpiece adaptor is available from the manufacturer for using disposable 1-way mouthpieces</td>
<td><a href="http://www.nspirehealth.com">www.nspirehealth.com</a></td>
</tr>
<tr>
<td>PiKo-6™</td>
<td>nSpire™</td>
<td>FEV₁, FEV₆, PEF</td>
<td>Same features as the PiKo-1, plus measurement and display of FEV₆ and FEV₁/FEV₆ (but not predicted or % pred)</td>
<td><a href="http://www.nspirehealth.com">www.nspirehealth.com</a></td>
</tr>
<tr>
<td>PulmoLife™</td>
<td>MicroMedical™</td>
<td>FEV₁, FEV₁ % pred</td>
<td>Airflow spins a turbine vane; measures FEV₁ and FEV₁ % pred (ERS 1993 or NHANES III race-specific references, or Chinese); quality messages for high BEV, cough, FET $&lt;$ 3 s and EOTV $&lt;$ 25 mL; color zones for COPD (based on FEV₁ % pred); lung age, a 3V lithium cell (CR-2450); uses standard disposable 1-way mouthpieces. Calibration checks can be done using a 3-L syringe</td>
<td><a href="http://www.viasyshealthcare.com">www.viasyshealthcare.com</a></td>
</tr>
</tbody>
</table>
The spirometers are listed in alphabetical order. Only those selling for less than approximately $400 at the time of this publication are included.

Abbreviations: % pred, % predicted; BEV, back extrapolated volume; COPD, chronic obstructive pulmonary disease; ERS, European Respiratory Society; EOTV, end-of-test volume; FET, forced expiratory time; FEV\textsubscript{n}, forced expiratory volume in n seconds; NHANES, National Health and Nutrition Examination Survey; PEF, peak expiratory flow; PC, personal computer; USB, universal serial bus.

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**Figure. Sample algorithm for screening patients in primary care for COPD\textsuperscript{1,7,15,16}**

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Primary care patient population

Respiratory symptoms consistent with COPD or family history of α\textsubscript{1}-antitrypsin deficiency

Assess risk, including:
- Current or past tobacco use
- Exposure to occupational/environmental pollutants
- Age ≥40 years

No risk factors

Screen for COPD

Risk factor(s) present

Do not screen

Pocket Spirometry

Lung Function Questionnaire

COPD Population Screener

FEV\textsubscript{1}/FVC
<0.70 and FEV\textsubscript{1} <80% predicted

Score ≥3

Score ≥5

Perform pre- and postbronchodilator spirometry and consider diagnosis of COPD
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Abbreviations: COPD, chronic obstructive pulmonary disease; FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity.