Clinical Policy Title: Pulmonary functions tests

Clinical Policy Number: 07.01.07

Effective Date: July 1, 2017
Initial Review Date: June 22, 2017
Most Recent Review Date: July 20, 2017
Next Review Date: July 2018

Related policies:
- CP# 07.01.04  Exhaled nitric oxide for diagnosis of lung disease
- CP# 07.02.07  Lung transplants

ABOUT THIS POLICY: Select Health of South Carolina has developed clinical policies to assist with making coverage determinations. Select Health of South Carolina’s clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of “medically necessary,” and the specific facts of the particular situation are considered by Select Health of South Carolina when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. Select Health of South Carolina’s clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. Select Health of South Carolina’s clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, Select Health of South Carolina will update its clinical policies as necessary. Select Health of South Carolina’s clinical policies are not guarantees of payment.

Policy contains:
- Spirometry.
- Pulmonary function tests.
- Asthma.
- Chronic obstructive pulmonary disease.

For this policy, pulmonary function tests (PFTs) are defined as the noninvasive measurement of inhaled and exhaled lung volume, total lung capacity, rates of air flow, and gas exchange.

Coverage policy

Select Health of South Carolina considers the use of PFTs to be clinically proven and, therefore, medically necessary when all of the following criteria are met:

- A pulmonary diagnosis or evaluation cannot be made clinically, or test results are necessary to manage the member’s clinical course.
- The test information is needed to determine any of the following:
  - The presence of lung disease or abnormal lung function.
  - The type of abnormality.
  - The extent of abnormality.
  - The extent of disability due to abnormal lung function.
  - One or more courses of therapy in the treatment of the particular condition.
- The test is ordered by a treating physician and used in the member’s care.
• The member is able to perform acceptable and reproducible maneuvers.

Select Health of South Carolina considers the use of spirometry that measures volume and air flow on inhalation and exhalation to be clinically proven and, therefore, medically necessary for the following indications:

• To evaluate abnormal symptoms or signs suggestive of pulmonary disease.
• To measure the effect of systemic disease on pulmonary function (e.g., neuromuscular disease and connective tissue disease).
• To assess preoperative risk in members undergoing thoracic surgery, or members undergoing major or complex surgery with known or suspected pulmonary disease.
• To assess prognosis in lung transplant recipients.
• To assess therapeutic effectiveness of bronchodilator therapy.
• To monitor for adverse reactions to drugs with known pulmonary toxicity.
• To assess reversibility of bronchospasm when signs or symptoms are consistent with bronchospasm or pre-bronchodilator spirometry is abnormal.
  - If reversibility of bronchospasm has been ruled out or demonstrated, repeat pre- and post-bronchodilator study is medically necessary only when there is a significant clinical change in the patient’s functional respiratory status requiring a change in bronchoactive medications, and this is documented in the patient’s medical record.

Select Health of South Carolina considers the use of spirometry for screening for asymptomatic patients with or without a high risk of lung disease (e.g., prolonged smoking history) to be investigational and, therefore, not medically necessary.

Limitations:

All other uses of PFTs are not medically necessary including, but not limited to:

• When a diagnosis or evaluation can be made clinically or when test results are not necessary to manage the patient’s disease.
• Routine use at each office visit when physical exam and medical interview confirm either the member’s claim of being stable or no clinically meaningful changes in pulmonary status.
• As part of an epidemiological survey.
• Peak flow meters (handheld spirometry) when used for diagnosing pulmonary disease.

Complete (or full) PFTs that incorporate body plethysmography, diffusion capacity, bronchoprovocation, and other age-appropriate maneuvers should be reserved for more complex cases to further quantify impairment and inform care management, particularly when there are inconsistencies between history, physical features, and spirometry.

• For the purpose of medical review, the provider must use the various PFT modalities in a purposeful and logical sequence in test selection.
Contraindications:
- PFTs can be physically demanding maneuvers and should be used cautiously in patients with medical conditions that could be adversely affected by an increase in: intrathoracic, intra-abdominal, and intracranial pressures; myocardial demand; venous return; systemic blood pressure; chest wall and lung expansion; and risk for active communicable diseases.
- Patients should not be tested within one month of a myocardial infarction.

Quality assurance considerations:
- PFTs are medically necessary for members who are able to perform acceptable and reproducible maneuvers. For young children with chronic lung disease or recurrent wheeze, PFTs tailored to the specific disease can be considered on a case-by-case basis.
- Spirometry studies, in particular, require a minimum of three attempts that must meet minimum acceptability criteria (Miller, 2005).
- Personnel who perform all PFTs should have verifiable training in all aspects of spirometry, lung volume, diffusion capacity, gas exchange, and pulmonary exercise testing, including equipment operation, quality control, and test outcomes relative to diagnosis and medical history.

Alternative covered services:
Physical examination and medical history.

Background
Pulmonary disease can affect the airways (large and small), lung parenchyma, pulmonary vasculature, and the respiratory muscles. In 2014, the third-leading cause of death in the United States was chronic lower respiratory disease comprising asthma and chronic obstructive pulmonary disease (COPD; emphysema and bronchitis; death rates from chronic lower respiratory diseases were highest among older persons, white males and females, and blacks/African Americans (Kochanek, 2016).

Accurate diagnosis of acute and chronic lung diseases can be challenging to achieve, particularly in primary care, because medical history and physical examination are not reliable for the differential diagnoses or estimating disease severity (José, 2014; Donner, 2011). Misdiagnosis of asthma may be as high as 30 percent, and early diagnosis of COPD is inadequately addressed in many settings (Chung, 2014; Donner, 2011). Inappropriate interpretation of symptoms, unawareness of symptoms, underreporting of symptoms, and inadequate standards of care have been implicated (Csikesz, 2014). Objective testing has become essential to appropriately characterize and manage acute and chronic lung disease.

Assessment of pulmonary physiology involves measurement of pulmonary mechanics (airflows and lung volumes), the ventilation-perfusion interrelationship, diffusion and gas exchange, and respiratory
muscle strength using maneuvers to measure and record the properties of these lung components. PFTs represent a battery of tests used to diagnose, stage, and monitor various pulmonary diseases (National Heart, Lung, and Blood Institute [NHLBI], 2015). They include spirometry, lung volume measurement, diffusing capacity for carbon monoxide, arterial blood gases, and exercise testing. Radiography, skin testing, and certain biomarkers such as the fraction of exhaled nitric oxide may be used in diagnosing lung disease (Csikesz, 2014).

**Spirometry:**

Spirometry is the most reproducible and readily available lung function test and is the primary focus of this policy. It is an effort-dependent maneuver in which a seated (or sometimes standing) patient inhales maximally into a mouthpiece from tidal breathing to total lung capacity and then rapidly exhales to the fullest extent until no further volume is exhaled. A spirometer measures either displaced volume or airflow by a flow-sensing device, such as a pneumotachometer, that mathematically derives volume. It is simple and easy to perform, unlike other PFTs that are more time-consuming and require specialized equipment and training. Instrumentation for spirometry can be portable, hand-held, or stationary.

The three most commonly used spirometric values are forced vital capacity (FVC), forced expired volume in one second (FEV₁), and the FEV₁/FVC ratio, but spirometry can provide other important measures of pulmonary mechanics (Miller, 2005):

- **FEV₁** — the maximal volume of air exhaled in the first second of a forced expiration from a position of full inspiration; a sensitive indicator of larger airway disease.
- **FVC** — the maximal volume of air exhaled with maximally forced effort from a maximal inspiration. FEV at two seconds (FEV₂) and FEV at three seconds (FEV₃) may approximate FVC in young children, and FEV at six seconds (FEV₆) may approximate FVC.
- **Expiratory vital capacity (EVC)** — the maximal volume of air exhaled from the point of maximal inhalation.
- **FEF₂₅₋₇₅** — the mean forced expiratory flow between 25 percent and 75 percent of the FVC; an indicator of small airway disease.
- **FEV₁/FVC** — an indicator of airway obstruction if the value is less than 70 percent (Global Initiative for Chronic Obstructive Lung Disease [GOLD], 2010). An alternative measure, the FEV₁/FEV₆, has been proposed.
- **Inspiratory capacity (IC)** — the volume change recorded when taking a slow full inspiration with no hesitation from a position of passive end-tidal expiration. IC is an indirect estimate of the degree of lung hyperinflation at rest, and is useful to assess changes in FRC with pharmacological treatment.
- **Inspiratory VC** — the maximal volume of air inhaled from the point of maximal exhalation, achieved by a slow expiration from end-tidal inspiration.
- **Maximum voluntary ventilation (MVV)** — the maximum volume of air a subject can breathe over a specified period of time (12 seconds for normal subjects); largely superseded by FEV₁.
• Peak flow — the maximum expiratory flow achieved from a maximum forced expiration, starting without hesitation from the point of maximal lung inflation; useful for assessing flow rate patterns, hence airway integrity, over time.
• Vital capacity (VC) — the volume represented from the position of full inspiration to complete expiration (unforced).

Spirometry can be administered in the ambulatory, office, emergency room, and inpatient settings. It can be performed without a bronchodilator for screening purposes or before-and-after a bronchodilator for diagnostic purposes. Practitioners and patients may use hand-held peak expiratory flow (PEF or peak flow) meters to monitor trends in air flow. Accurate interpretation of results requires maximal patient effort and well-defined acceptability and reproducibility standards (Miller, 2005). Normative values are derived from population studies of healthy subjects with similar age, race, weight, and height to which measured values are compared to approximate disease severity.

 Searches

Select Health of South Carolina searched PubMed and the databases of:
• UK National Health Services Centre for Reviews and Dissemination.
• Agency for Healthcare Research and Quality’s National Guideline Clearinghouse and other evidence-based practice centers.
• The Centers for Medicare & Medicaid Services (CMS).


We included:
• Systematic reviews, which pool results from multiple studies to achieve larger sample sizes and greater precision of effect estimation than in smaller primary studies. Systematic reviews use predetermined transparent methods to minimize bias, effectively treating the review as a scientific endeavor, and are thus rated highest in evidence-grading hierarchies.
• Guidelines based on systematic reviews.
• Economic analyses, such as cost-effectiveness, and benefit or utility studies (but not simple cost studies), reporting both costs and outcomes — sometimes referred to as efficiency studies — which also rank near the top of evidence hierarchies.

Findings

We identified two systematic reviews and 11 evidence-based practice guidelines for this policy. Medical history and physical examination are essential but often inadequate means of excluding diagnoses or
characterizing the status of lung impairment, and symptoms often do not correlate with objective assessment. Quantitative measures of lung function are standard of care for persons with acute or chronic lung disease. Spirometry is the most frequently used PFT. It is an accurate, available, noninvasive, safe, and relatively inexpensive first-line test for evaluating lung function.

As a diagnostic test, the evidence supports spirometry when medical history and physical examination are inadequate to inform care, and quantitative information is necessary to (National Institute for Health and Care Excellence [NICE] 2016; Meyer, 2016; GOLD, 2010):

- Determine the presence, type, and severity of obstructive, restrictive, and combined obstructive/restrictive lung defects.
- Confirm a diagnosis.
- Measure therapeutic response.
- Assess preoperative risk in persons undergoing thoracic surgery or undergoing major or complex surgery with known or suspected pulmonary disease.
- Monitor allograft status before and after lung transplantation.

Other findings include:

- Peak flow meters should be used to monitor changes in flow rates, but not to diagnose pulmonary disease (Chung, 2014).
- The value of spirometry in children younger than 6 years of age is less clear (Rosenfeld, 2013; Kang, 2016; Lahiri, 2016). Spirometry can identify pulmonary exacerbations and monitor treatment response in those children able to perform acceptable and reproducible maneuvers. The evidence argues against routine use in diagnostic evaluation and clinical monitoring of infants and very young children with cystic fibrosis (CF), bronchopulmonary dysplasia (BPD), or recurrent wheeze, but PFTs tailored to the specific disease in this population can be considered on a case-by-case basis.
- Complete or full PFTs that incorporate body plethysmography, diffusion capacity, arterial blood gases, and other age-appropriate PFTs should be reserved for more complex cases to further quantify impairment and inform care management, particularly when there are inconsistencies between history, physical features, and spirometry (Chung, 2014).

Potential risks associated with PFTs relate to the physiologic effects and anatomical demand that forced maneuvers can inflict on intrathoracic, intra-abdominal, and intracranial pressures; myocardial demand; venous return; systemic blood pressure; and chest wall and lung expansion. There is also an increased risk in acquiring active communicable diseases. Most contraindications to PFTs are relative and require a delay in performing them until the issues resolve, as opposed to outright avoidance.

Despite reports of underdiagnosis of COPD and misdiagnosis of asthma, spirometry as a screening test (often referred to as pre-bronchodilator spirometry) in asymptomatic populations remains controversial. Screening comprises validated questionnaires, spirometry, or both. The rationale for more intensive case-finding in asymptomatic populations using spirometry is to identify lung disease at an
earlier stage when treatment and prevention strategies can affect health outcomes. While there is a need to improve early and accurate diagnosis of various lung conditions, current evidence does not support a health, treatment, or smoking cessation benefit in screen-detected populations (Guirguis-Blake, 2016). Multiple evidence-based guidelines do not support screening spirometry in the absence of symptoms (GOLD, 2010; U.S. Preventive Services Task Force [USPSTF], 2016; Coates, 2013; Qaseem, 2011).

As the use of spirometry increases, principally in office-based settings, access to quality spirometry is a major concern. The results must be interpreted carefully as all lung function tests are effort dependent. The American Thoracic Society (ATS), the European Respiratory Society (ERS), and GOLD have developed clinical practice and quality assurance guidelines for PFTs to improve testing quality and interpretation (Miller, 2005; GOLD, 2017). PFTs should be performed and interpreted by providers with demonstrated proficiency in test performance and interpretation.

Policy updates:

None.

Summary of clinical evidence:

<table>
<thead>
<tr>
<th>Citation</th>
<th>Content, Methods, Recommendations</th>
</tr>
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<tbody>
<tr>
<td>GOLD (2017)</td>
<td>Key points:</td>
</tr>
<tr>
<td>Guideline: From the Global Strategy for the Diagnosis, Management and Prevention of COPD</td>
<td>• The role of screening at-risk populations in primary care is more controversial.</td>
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<td></td>
<td>• Whether early detection in relatively asymptomatic smokers significantly increases tobacco cessation rates is unclear.</td>
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<td>• The most cost-effective method would appear to be a case-finding technique and performing spirometry in those at risk of COPD.</td>
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<td>• Clinicians should suspect COPD and perform spirometry when indicators are present in an individual aged over 40 years: chronic cough or sputum production, dyspnea, and/or history of exposure to risk factors (e.g., tobacco smoke, occupational dusts, home cooking, and biomass fuels).</td>
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<tr>
<td>Guirguis-Blake (2016) for AHRQ</td>
<td>Key points:</td>
</tr>
<tr>
<td>Screening for COPD</td>
<td>• Systematic review of diagnostic accuracy; five studies (n=3,048) of three externally validated COPD questionnaires; two studies of pre-bronchodilator PF; two studies of pre-bronchodilator microspirometry (FEV_1/FEV_6); one study of post-bronchodilator microspirometry (FEV_1/FEV_6); one study of a staged approach incorporating both the COPD Diagnostic Questionnaire and (FEV_1/FEV_6) tests; five randomized controlled trials (RCTs) (n=1,620) of the effectiveness of COPD screening in influencing smoking cessation rates; and 14 treatment RCTs in screen-detected patients.</td>
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<tr>
<td></td>
<td>• Overall quality: low to moderate. High risk of bias, incomplete reporting of study design elements and harms.</td>
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|                               | • Insufficient evidence to support that systematic screening for COPD in primary care improves health outcomes, or offers a treatment or smoking cessation benefit in screen-


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<tr>
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<th>Content, Methods, Recommendations</th>
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| Kang (2016) for the American Academy of Neurology and the American Association of Neuromuscular & Electrodiagnostic Medicine Guideline: Evaluation, diagnosis, and management of congenital muscular dystrophy (CMD) | **Key points:**  
- Physicians should monitor PFTs such as spirometry and oxygen saturation in the awake and sleep states of patients with CMD, with monitoring levels individualized on the basis of the child’s clinical status (Level B). |
| Lahiri (2016) Guideline: From the CF Foundation for Preschoolers With CF | **Key points:**  
- For children with CF, ages 2 to 5 years, spirometry should be attempted as early as age 3 years, depending on the developmental stage of the individual child (Consensus recommendation).  
- For children with CF, ages 3 years and older, use spirometry to identify pulmonary exacerbations and monitor treatment response in those children able to perform acceptable and reproducible maneuvers (Consensus recommendation). |
| NICE (2016) Guideline: Routine preoperative tests for elective surgery | **Key points:**  
- Routine PFTs and arterial blood gas analysis before surgery are not recommended, based on low or very-low-quality evidence suggesting that test may provide reassurance both to the patients and clinician before surgery, but had no real impact on perioperative or general clinical management.  
  - Exception: Thoracic surgery or those with respiratory problems undergoing major or complex surgery.  
- Spirometry alone is sufficient for guiding perioperative management in most patients.  
- PFTs may have a role in optimizing the patient before surgery under the advice of an anesthetist, leading to better postoperative management.  
- There is uncertainty about which patients with known or suspected respiratory disease require preoperative lung function tests, what time period prior to surgery these are required, and whether spirometry or more sophisticated tests are indicated. |
| Skloot (2016) for the ATS Guideline: Asthma in the elderly | **Key points:**  
- Spirometry and airway reactivity measurements are first-line methods for diagnosing and monitoring asthma in the elderly.  
- Age-adjusted values are essential for interpretation to avoid overdiagnosing respiratory impairment.  
- Normative data for nonwhite individuals and for those older than 75 years are sparse. |
| USPSTF (2016) Guideline: Screening for COPD | **Key points:**  
- “D” recommendation against screening for COPD in asymptomatic adults based on the conclusion that screening for COPD had no net benefit and large associated opportunity costs.  
- Inadequate evidence to conclude on the harms of screening, improvement in health |
<table>
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<tr>
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<tbody>
<tr>
<td>Haroon (2015)</td>
<td><strong>Key points:</strong></td>
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<td>• Systematic review and meta-analysis of three RCTs, one controlled trial, and 35 uncontrolled studies that included pre-screening with questionnaires (n=13), handheld flow meters (n=5), or direct invitation to diagnostic spirometry (n=30).</td>
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<td>• Overall quality: low. Heterogeneous studies, lack of comparison groups, inadequate reporting, and diversity in the definition of COPD.</td>
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<td>• Any approach identified more undiagnosed COPD versus usual care; targeting those at higher risk (e.g., smokers) and pre-screening (e.g., using questionnaires) is likely to increase the yield, but impact on clinical care and patient outcomes is unknown.</td>
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<td>• Well-conducted RCTs are needed.</td>
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<td>Chung (2014) for the ERS/ATS</td>
<td><strong>Key points:</strong></td>
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<tr>
<td>Guideline: Definition, evaluation and treatment of severe asthma</td>
<td>• Spirometry with both inspiratory and expiratory loops, following pre- and post-bronchodilator administration, should be obtained to confirm reversible airflow limitation.</td>
</tr>
<tr>
<td></td>
<td>• Further testing with complete PFTs, including diffusing capacity and bronchoprovocation testing, in the case of relatively preserved lung function can be considered on a case-by-case basis, particularly when there are inconsistencies between history, physical features, and spirometry.</td>
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<tr>
<td>Meyer (2014) for the International Society for Heart and Lung Transplantation, ATS, and ERS</td>
<td><strong>Key points:</strong></td>
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<tr>
<td>Guideline: Diagnosis and management of bronchiolitis obliterans syndrome (BOS) in lung transplantation recipients</td>
<td>• In most transplant centers, lung transplant recipients (including asymptomatic patients) receive sustained follow-up including routine clinical evaluation, spirometry (both in the clinic and in remote in-home settings), and other methods for monitoring allograft status (such as fiber-optic bronchoscopy, as appropriate).</td>
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<td>• Such monitoring is generally sustained beyond the first 6–12 months following transplantation.</td>
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<tr>
<td>Coates (2013) for the Canadian Thoracic Society</td>
<td><strong>Key points:</strong></td>
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<tr>
<td>Guideline: Spirometry in primary care</td>
<td>• Based on the joint ATS/ERS standards for PFTs (Miller, 2005).</td>
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<td>• Potential risks associated with spirometry and other forced expiratory maneuvers relate to increased intrathoracic, intra-abdominal, and intracranial pressures; myocardial demand; venous return; systemic blood pressure; chest wall and lung expansion; and active communicable diseases. This calls for prudence in patients with medical conditions that could be adversely affected by these physiological consequences.</td>
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<tr>
<td>Rosenfeld (2013) for the ATS</td>
<td><strong>Key points:</strong></td>
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<tr>
<td>Guideline: Optimal lung function tests for monitoring CF, BPD, and recurrent</td>
<td>• Recommendations covered infant pulmonary function testing (raised-volume rapid thoracic compression and plethysmography); preschool spirometry; specific airway resistance; the interrupter technique; the forced oscillation technique; and multiple-breath washout.</td>
</tr>
</tbody>
</table>
**Citation**

- wheezing in children less than 6 years of age

**Content, Methods, Recommendations**

- All tests are safe and feasible; sedated infant lung function testing requires extensive training; unclear impact of testing on patient outcomes.
- Reference data are predominantly from non-Hispanic white children, device- and technique-dependent, and derived from low-quality data.
- Insufficient evidence to support routine use in diagnostic evaluation and clinical monitoring of infants and young children with CF, BPD, or recurrent wheeze; may be valuable for specific concerns (e.g., ongoing symptoms or treatment monitoring), and as outcome measures in clinical research studies.

**Key points:**

- Spirometry should be obtained to diagnose airflow obstruction in patients with respiratory symptoms (grade: strong recommendation, moderate-quality evidence).
- Spirometry should not be used to screen for airflow obstruction in individuals without respiratory symptoms (grade: strong recommendation, moderate-quality evidence).

**Qaseem (2011) for the ACP, ACCP, ATS, and ERS**

**Guideline: Diagnosis and Management of Stable COPD**

**Key points:**

- Recommends spirometry to demonstrate obstruction and assess reversibility, including in children ≥5 years of age using a short-acting bronchodilator.
- Recommends considering spirometry to establish a diagnosis of asthma if any of these indicators is present:
  - Wheezing, history of cough (particularly at night), recurrent wheezing, dyspnea, or chest tightness.
  - Symptoms occur or worsen in the presence of exogenous factors (infection, exposure to allergens, airborne particles, changes in weather), strong emotional expression, and menstrual cycles.
  - Symptoms occur or worsen at night, awakening the patient.
- Office-based physicians who care for asthma patients should have access to spirometry for diagnosis and periodic monitoring using equipment and techniques that meet ATS standards.


**Guideline: Diagnosis and management of asthma**

**Key points:**

- Recommends spirometry to establish a diagnosis of asthma if any of these indicators is present:
  - Wheezing, history of cough (particularly at night), recurrent wheezing, dyspnea, or chest tightness.
  - Symptoms occur or worsen in the presence of exogenous factors (infection, exposure to allergens, airborne particles, changes in weather), strong emotional expression, and menstrual cycles.
  - Symptoms occur or worsen at night, awakening the patient.
- Office-based physicians who care for asthma patients should have access to spirometry for diagnosis and periodic monitoring using equipment and techniques that meet ATS standards.

**References**

**Professional society guidelines/other:**


**Peer-reviewed references:**


**CMS National Coverage Determinations (NCDs):**

No NCDs identified as of the writing of this policy.

**Local Coverage Determinations (LCDs):**


**Commonly submitted codes**

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

<table>
<thead>
<tr>
<th>CPT Code</th>
<th>Description</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>94010</td>
<td>Spirometry, including graphic record, total and timed vital capacity, expiratory flow rate measurement(s), with or without maximal voluntary ventilation</td>
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<tr>
<td>94011</td>
<td>Measurement of spirometric forced expiratory flows in an infant or child through 2 years of age</td>
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<tr>
<td>94012</td>
<td>Measurement of spirometric forced expiratory flows, before and after bronchodilator, in an infant or child through 2 years of age</td>
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<tr>
<td>94013</td>
<td>Measurement of lung volumes (ie, functional residual capacity [FRC], forced vital capacity [FVC], and expiratory reserve volume [ERV]) in an infant or child through 2 years of age</td>
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<tr>
<td>94060</td>
<td>Bronchodilation responsiveness, spirometry as in 94010, pre-and post-bronchodilator administration</td>
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<tr>
<td>94070</td>
<td>Bronchospasm provocation evaluation, multiple spirometric determinations as in 94010, with administered agents (eg, antigen[s], cold air, methacholine)</td>
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<tr>
<td>94150</td>
<td>Vital capacity, total (separate procedure)</td>
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<td>94200</td>
<td>Maximum breathing capacity, maximal voluntary ventilation</td>
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<td>94250</td>
<td>Expired gas collection, quantitative, single procedure (separate procedure)</td>
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<tr>
<td>94375</td>
<td>Respiratory flow volume loop</td>
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<td>94400</td>
<td>Breathing response to CO2 (CO2 response curve)</td>
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<td>94450</td>
<td>Breathing response to hypoxia (hypoxia response curve)</td>
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<tr>
<td>94620</td>
<td>Pulmonary stress testing; simple (eg, 6-minute walk test, prolonged exercise test for bronchospasm with pre- and post-spirometry and oximetry)</td>
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<tr>
<td>94621</td>
<td>Pulmonary stress testing; complex (including measurements of CO2 production, O2 uptake, and electrocardiographic recordings)</td>
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<tr>
<td>94640</td>
<td>Pressurized or nonpressurized inhalation treatment for acute airway obstruction for therapeutic purposes and/or for diagnostic purposes such as sputum induction with an aerosol generator, nebulizer, metered dose inhaler or intermittent positive pressure breathing (IPPB) device</td>
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<tr>
<td>94664</td>
<td>Demonstration and/or evaluation of patient utilization of an aerosol generator, nebulizer, metered dose inhaler or IPPB device</td>
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<tr>
<td>94680</td>
<td>Oxygen uptake, expired gas analysis; rest and exercise, direct, simple</td>
<td></td>
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<tr>
<td>94681</td>
<td>Oxygen uptake, expired gas analysis; including CO2 output, percentage oxygen extracted</td>
<td></td>
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<tr>
<td>94690</td>
<td>Oxygen uptake, expired gas analysis; rest, indirect (separate procedure)</td>
<td></td>
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<tr>
<td>94726</td>
<td>Plethysmography for determination of lung volumes and, when performed, airway resistance</td>
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<tr>
<td>94727</td>
<td>Gas dilution or washout for determination of lung volumes and, when performed, distribution of ventilation and closing volumes</td>
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<tr>
<td>94728</td>
<td>Airway resistance by impulse oscillometry</td>
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<tr>
<td>94729</td>
<td>Diffusing capacity (eg, carbon monoxide, membrane) (List separately in addition to code for primary procedure)</td>
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<tr>
<td>94750</td>
<td>Pulmonary compliance study (eg, plethysmography, volume and pressure measurements)</td>
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<tr>
<td>ICD-10 Code</td>
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