

Screening for Chronic Obstructive Pulmonary Disease Using Spirometry: U.S. Preventive Services Task Force Recommendation Statement

U.S. Preventive Services Task Force*

Description: New U.S. Preventive Services Task Force (USPSTF) recommendation about screening for chronic obstructive pulmonary disease (COPD) using spirometry.

Methods: The USPSTF weighed the benefits (prevention of ≥ 1 exacerbation and improvement in respiratory-related health status measures) and harms (time and effort required by both patients and the health care system, false-positive screening tests, and adverse effects of subsequent unnecessary therapy) of COPD screening identified in the accompanying review of the evidence. The

USPSTF did not consider the financial costs of spirometry testing or COPD therapies.

Recommendation: Do not screen adults for COPD using spirometry. (Grade D recommendation)

Ann Intern Med. 2008;148:529-534.

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For author affiliations, see end of text.

*For a list of members of the U.S. Preventive Services Task Force, see the **Appendix** (available at www.annals.org).

The U.S. Preventive Services Task Force (USPSTF) makes recommendations about preventive care services for patients without recognized signs or symptoms of the target condition.

It bases its recommendations on a systematic review of the evidence of the benefits and harms and an assessment of the net benefit of the service.

The USPSTF recognizes that clinical or policy decisions involve more considerations than this body of evidence alone. Clinicians and policymakers should understand the evidence but individualize decision making to the specific patient or situation.

SUMMARY OF RECOMMENDATION AND EVIDENCE

The USPSTF recommends against screening adults for chronic obstructive pulmonary disease (COPD) using spirometry. This is a grade D recommendation. See the **Figure** for a summary of the recommendation and its impact on clinical practice.

Table 1 describes the USPSTF grades, and **Table 2** describes the USPSTF classification of levels of certainty about net benefit. Both are also available online at www.annals.org.

RATIONALE

Importance

Chronic obstructive pulmonary disease is the fourth leading cause of death in the United States, and it affects more than 5% of the adult U.S. population.

Detection

Chronic obstructive pulmonary disease is characterized by airflow limitation that is not fully reversible, is usually progressive, and is associated with an abnormal inflammatory response of the lung to noxious particles or gases. The diagnosis is based on objective airflow limitation, defined as an FEV₁–FVC ratio less than 0.70 with less than 12% reversibility, in association with risk factors (such as smoking history) and/or symptoms (such as chronic sputum production, wheezing, or dyspnea).

Good evidence indicates that history and clinical examination are not accurate predictors of airflow limitation. Fair evidence indicates that most individuals with airflow obstruction do not recognize or report symptoms. Fair evidence also indicates that fewer than 10% of those identified by screening spirometry have severe or very severe COPD, using current diagnostic criteria.

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Appendix
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CME quiz
Downloadable recommendation summary
Audio summary

Benefits of Detection and Early Treatment

All individuals with COPD, including those with mild or moderate illness, would benefit from smoking cessation and annual influenza vaccination. However, fair evidence shows that providing smokers with spirometry results does not independently improve cessation rates. In addition, although fair evidence suggests that influenza vaccination reduces COPD exacerbations, no studies have examined whether performing spirometry increases influenza vaccination rates.

Good evidence suggests that pharmacologic therapy prevents exacerbations (worsening of symptoms, need for medical care) but does not affect hospitalizations or all-cause mortality among symptomatic individuals who have been smokers in the past (“ever smokers”), who are 40 years of age or older, and who have severe or very severe COPD ($FEV_1 < 50\%$ of predicted).

Fair evidence shows that both pharmacologic therapy and pulmonary rehabilitation improve respiratory-related health status measures, but the relationship of these measures to clinically meaningful functional outcomes is not well established. Fair evidence also shows that supplemental oxygen reduces mortality in individuals with resting hypoxia.

Whether individuals who do not recognize or report symptoms but meet spirometric criteria for a diagnosis of severe to very severe COPD would benefit from pharmacologic treatment to the same degree as symptomatic individuals, or at all, is not known. Benefits experienced by individuals who do not recognize or report symptoms are unlikely to be greater than those in symptomatic individuals.

The evidence suggests that the potential benefit of spirometry-based screening for COPD is the prevention of 1 or more exacerbations by treating patients with previously undetected airflow obstruction. By definition, an exacerbation requires medical care. Although an unknown proportion of patients who present with clinical symptoms of an exacerbation does not receive a COPD diagnosis, the incremental benefit of early detection over clinical diagnosis for the remainder of patients would, at most, be a deferral of the first exacerbation.

These incremental benefits are judged to be no greater than small.

Harms of Detection and Early Treatment

The opportunity costs (time and effort required by both patients and the health care system) associated with screening for COPD using spirometry are large even in populations at higher risk. The physical performance of spirometry has not been associated with adverse effects. Fair evidence indicates that spirometry can lead to substantial overdiagnosis of COPD in “never smokers” older than age 70 years, and that it produces fewer false-positive results in other healthy adults. Good evidence suggests that pharmacologic therapies are associated with adverse effects,

including oropharyngeal candidiasis, easy bruising, dry mouth, urinary retention, and sinus tachycardia.

These harms are judged to be no less than small.

USPSTF Assessment

The USPSTF concludes that there is at least moderate certainty that screening for COPD using spirometry has no net benefit.

CLINICAL CONSIDERATIONS

Patient Population

This recommendation applies to healthy adults who do not recognize or report respiratory symptoms to a clinician. It does not apply to individuals with a family history of α_1 -antitrypsin deficiency. For individuals who present to clinicians with chronic cough, increased sputum production, wheezing, or dyspnea, spirometry would be indicated as a diagnostic test for COPD, asthma, and other pulmonary diseases.

Risk Assessment

Screening for COPD would in theory benefit adults with a high probability of severe airflow obstruction who might benefit from inhaled therapies. Risk factors for COPD include current or past tobacco use, exposure to occupational and environmental pollutants, and older age. However, even in groups with the greatest prevalence of airflow obstruction, hundreds of patients would need to be screened with spirometry to defer 1 exacerbation. For example, under the best-case assumptions about response to therapy, an estimated 455 adults between 60 and 69 years of age would need to be screened to defer 1 exacerbation.

Screening Tests

Spirometry can be performed in a primary care physician’s office or in a pulmonary testing laboratory. The USPSTF did not review evidence comparing the accuracy of spirometry performed in the primary care versus referral settings.

Other Approaches to Prevention

Regardless of the presence or absence of airflow obstruction, all current smokers should receive smoking cessation counseling and be offered pharmacologic therapies demonstrated to increase cessation rates. All patients 50 years of age or older should be offered influenza vaccine annually. All patients 65 years of age or older should be offered pneumococcal vaccine.

Useful Resources

The USPSTF strongly recommends that clinicians screen all adults for tobacco use and provide tobacco cessation interventions for those who use tobacco products. The USPSTF recommendation on counseling to prevent tobacco use (1), along with supporting evidence, is available on the Agency for Healthcare Research and Quality’s Web site (www.ahrq.gov).

OTHER CONSIDERATIONS

Research Needs/Gaps

Further research is needed into the efficacy of various treatments for adults with airflow obstruction who do not recognize or report symptoms, for never smokers, and for smokers younger than 40 years of age. Studies are also needed on whether primary care screening for respiratory symptoms can detect patients with a clinical diagnosis of severe or very severe COPD. In addition, studies are needed to assess the diagnostic accuracy of spirometry performed in primary care compared with specialty care settings. Studies should also assess what proportion of patients with previously undiagnosed airflow obstruction who present with a first COPD exacerbation does not receive a clinical diagnosis of COPD.

DISCUSSION

Burden of Disease

Two good-quality population-based studies measured the prevalence of spirometric airflow obstruction in representative samples of a general U.S. population (2, 3). The prevalence of airflow obstruction consistent with COPD increased with age, affecting 2.6% of all persons 50 to 59 years of age and 4.2% of those 70 to 74 years of age. Airflow obstruction was more common in current or past smokers. Among current smokers, mild or moderate degrees of airflow obstruction (calculated from National Health and Nutritional Examination Survey data [2, 3], after Wilt and colleagues [4]) were nearly 10 times as prevalent as severe airflow obstruction (19.8% vs. 2.1%).

Scope of Review

The evidence review for this USPSTF recommendation (5) updated and supplemented a previous systematic review that had examined high-quality evidence on the prevalence of and risk factors for airflow obstruction; randomized, controlled trials investigating whether providing spirometry results affected smoking cessation rates; and randomized, controlled trials testing the effectiveness of inhaled COPD therapies (4). The evidence review also examined randomized, controlled trials for benefits of screening on morbidity and mortality outcomes; high-quality evidence on harms of spirometry; systematic reviews of harms of COPD therapies; and systematic reviews of benefits and harms of influenza and pneumococcal vaccinations.

Accuracy of Screening Tests

Because spirometry is used as a confirmatory test as well as a screening test for COPD, no gold standard exists for comparison to provide precise estimates of sensitivity and specificity. Two cross-sectional studies that performed spirometry tests in adults with no history of tobacco use or respiratory disease suggest that spirometry yields some false-positive results and that the number of false-positive results increases in patients older than 70 years of age (6, 7). However, no studies have tested current COPD diag-

nostic criteria, which require at least 2 abnormal spirometry measurements that do not differ by more than 5%.

Effectiveness of Early Detection and Treatment

No controlled studies have compared clinical outcomes between screened and nonscreened populations. Randomized, controlled trials of pharmacologic therapies have generally enrolled patients with clinically detected COPD; this population is unlikely to be similar to a population with spirometric screening–detected COPD. Patients identified through screening do not recognize or report symptoms, and on the basis of prevalence studies, most would be expected to have mild or moderate COPD. A systematic review and meta-analysis of randomized, controlled trials of treatment found small improvements in exacerbations, health status measures, and mortality only in symptomatic patients with severe COPD (8).

The hypothesis that early detection of COPD with spirometry, alone or as part of a multicomponent intervention, leads to improved smoking cessation rates has been tested in several randomized, controlled trials. Two such trials that evaluated the independent effect of spirometry found no statistically significant difference in cessation rates between smokers who were provided spirometry results and control participants (9, 10).

Opportunity costs (time and effort required by both patients and the health care system), anxiety associated with false-positive results, and adverse effects from appropriately or inappropriately prescribed medications are all potential harms of screening for COPD using spirometry. Several good- or fair-quality meta-analyses have concluded that inhaled COPD therapies are commonly associated with minor adverse effects. Evidence of their association with major adverse effects (myocardial infarction, hip fracture, pneumonia) is inconsistent.

Estimate of Magnitude of Net Benefit

In patients similar to those in the randomized, controlled trials, inhaled COPD therapies can result in an absolute reduction in exacerbations. Using estimates obtained from population-based studies, one can determine the number of patients needed to screen with spirometry to defer the first exacerbation in various age groups. Assuming that patients who do not recognize or report symptoms benefit to the same degree as patients in the randomized, controlled trials and that benefits of therapy are similar across all age groups, the number needed to screen ranges from 400 (in patients age 70 to 74 years) to 2500 (in patients age 40 to 49 years). Limiting screening spirometry to smokers older than 40 years of age, as advocated by some groups, produces a number needed to screen of 833 to defer the first exacerbation.

Weighing this benefit against potential harms, there is at least moderate certainty that screening for COPD using spirometry has no net benefit.

How Does the Evidence Fit with Biological Understanding?

Aside from smoking cessation, COPD therapies produce modest benefits. To date, trials of COPD therapies have enrolled few patients with screening-detected COPD; thus, it is not possible to determine whether these modest benefits of treatment would be realized by patients with severe COPD detected with screening spirometry. Since 4 out of 5 cases of COPD result from tobacco use, an early intervention strategy of providing evidence-based therapies proven to increase smoking cessation rates and smoking abstinence is likely to be more effective than an early detection strategy of performing spirometry on patients who do not recognize or report respiratory symptoms.

RECOMMENDATIONS OF OTHERS

The American College of Physicians recommended in 2007 that “spirometry should not be used to screen for airflow obstruction in asymptomatic individuals,” including those with COPD risk factors (11).

The Global Initiative for Chronic Obstructive Lung Disease updated its consensus guideline in 2007. Although the guideline did not address population-based screening using spirometry, it recommended that clinicians consider a diagnosis of COPD “in any patient who has dyspnea, chronic cough or sputum production, and/or a history of exposure to risk factors for the disease” and that the “diagnosis should be confirmed by spirometry” (12).

In 2004, the American Thoracic Society and the European Respiratory Society recommended performing spirometry on all persons with tobacco exposure, a family history of chronic respiratory illness, or respiratory symptoms (13).

From the U.S. Preventive Services Task Force, Agency for Healthcare Research and Quality, Rockville, Maryland.

Disclaimer: Recommendations made by the USPSTF are independent of the U.S. government. They should not be construed as an official position of the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.

Financial Support: The USPSTF is an independent, voluntary body. The U.S. Congress mandates that the Agency for Healthcare Research and Quality support the operations of the USPSTF.

Potential Financial Conflicts of Interest: None disclosed.

Requests for Single Reprints: Reprints are available from the USPSTF Web site (www.preventiveservices.ahrq.gov).

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Figure. Screening for chronic obstructive pulmonary disease (COPD) using spirometry: clinical summary of a U.S. Preventive Services Task Force (USPSTF) recommendation statement.

Annals of Internal Medicine



Screening for Chronic Obstructive Pulmonary Disease Using Spirometry:
Clinical Summary of a U.S. Preventive Services Task Force Recommendation Statement

| | |
|---|--|
| Population | Adult General Population |
| Recommendation | Do not screen for chronic obstructive pulmonary disease using spirometry Grade: D |
| Additional population information | This screening recommendation applies to healthy adults who do not recognize or report respiratory symptoms to a clinician. It does not apply to individuals with a family history of α_1 -antitrypsin deficiency. |
| Risk assessment | Risk factors for COPD include: <ul style="list-style-type: none"> • current or past tobacco use • exposure to occupational and environmental pollutants • age 40 years or older |
| Screening tests* | Spirometry can be performed in a primary care physician's office or in a pulmonary testing laboratory. The USPSTF did not review evidence comparing the accuracy of spirometry performed in primary care versus referral settings. For individuals who present to clinicians reporting chronic cough, increased sputum production, wheezing, or dyspnea, spirometry would be indicated as a diagnostic test for COPD, asthma, and other pulmonary diseases. |
| Other approaches to the prevention of pulmonary illnesses | These services should be offered to patients regardless of COPD status: <ul style="list-style-type: none"> • All current smokers should receive smoking cessation counseling and be offered pharmacologic therapies demonstrated to increase cessation rates. • All patients 50 years of age or older should be offered influenza immunization annually. • All patients 65 years of age or older should be offered one-time pneumococcal immunization. |
| Relevant USPSTF recommendations | Clinicians should screen all adults for tobacco use and provide tobacco cessation interventions for those who use tobacco products. The USPSTF tobacco cessation counseling recommendation and supporting evidence are available at www.ahrq.gov/clinic/uspstf/uspstbac.htm |

For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement of *Screening for Chronic Obstructive Pulmonary Disease Using Spirometry*, and supporting documents, please go to www.preventiveservices.ahrq.gov. *The potential benefit of spirometry-based screening for COPD is prevention of 1 or more exacerbations by treating patients found to have previously undetected airflow obstruction. However, even in groups with the greatest prevalence of airflow obstruction, hundreds of patients would need to be screened with spirometry to defer 1 exacerbation.

Table 1. What the U.S. Preventive Services Task Force Grades Mean and Suggestions for Practice*

| Grade | Definition | Suggestions for Practice |
|-------------|--|---|
| A | The USPSTF recommends the service. There is high certainty that the net benefit is substantial. | Offer/provide this service. |
| B | The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial. | Offer/provide this service. |
| C | The USPSTF recommends against routinely providing the service. There may be considerations that support providing the service in an individual patient. There is moderate or high certainty that the net benefit is small. | Offer/provide this service only if other considerations support offering or providing the service in an individual patient. |
| D | The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits. | Discourage the use of this service. |
| I statement | The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined. | Read clinical considerations section of USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms. |

* USPSTF = U.S. Preventive Services Task Force.

Table 2. U.S. Preventive Services Task Force Levels of Certainty Regarding Net Benefit

| Level of Certainty* | Description |
|---------------------|---|
| High | The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies. |
| Moderate | The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by such factors as: the number, size, or quality of individual studies inconsistency of findings across individual studies limited generalizability of findings to routine primary care practice lack of coherence in the chain of evidence. As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion. |
| Low | The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of: the limited number or size of studies important flaws in study design or methods inconsistency of findings across individual studies gaps in the chain of evidence findings that are not generalizable to routine primary care practice a lack of information on important health outcomes. More information may allow an estimation of effects on health outcomes. |

* The U.S. Preventive Services Task Force (USPSTF) defines *certainty* as “likelihood that the USPSTF assessment of the net benefit of a preventive service is correct.” The net benefit is defined as benefit minus harm of the preventive service as implemented in a general primary care population. The USPSTF assigns a certainty level based on the nature of the overall evidence available to assess the net benefit of a preventive service.

APPENDIX: U.S. PREVENTIVE SERVICES TASK FORCE

Members of the U.S. Preventive Services Task Force† are Ned Calonge, MD, MPH, *Chair* (Colorado Department of Public Health and Environment, Denver, Colorado); Diana B. Petitti, MD, MPH, *Vice Chair* (Keck School of Medicine, University of Southern California, Sierra Madre, California); Thomas G. DeWitt, MD (Children's Hospital Medical Center, Cincinnati, Ohio); Leon Gordis, MD, MPH, DrPH (Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland); Allen J. Dietrich, MD (Dartmouth Medical School, Lebanon, New Hampshire); Kimberly D. Gregory, MD, MPH (Cedars-Sinai Medical Center, Los Angeles, California); Russell Harris, MD, MPH (University of North Carolina School of Medicine, Chapel Hill, North Carolina); George J. Isham, MD, MS (HealthPartners, Minneapolis, Minnesota); Michael L. LeFe-

vre, MD, MSPH (University of Missouri School of Medicine, Columbia, Missouri); Roseanne Leipzig, MD, PhD, (Mount Sinai School of Medicine, New York, New York); Carol Loveland-Cherry, PhD, RN (University of Michigan School of Nursing, Ann Arbor, Michigan); Lucy N. Marion, PhD, RN (Medical College of Georgia, Augusta, Georgia); Virginia A. Moyer, MD, MPH (University of Texas Health Science Center, Houston, Texas); Judith K. Ockene, PhD (University of Massachusetts Medical School, Worcester, Massachusetts); George F. Sawaya, MD (University of California, San Francisco, San Francisco, California); and Barbara P. Yawn, MD, MSPH, MSc (Olmsted Medical Center, Rochester, Minnesota).

†This list includes members of the Task Force at the time this recommendation was finalized. For a list of current Task Force members, go to www.ahrq.gov/clinic/uspstfab.htm.