Intro

Chronic obstructive pulmonary disease is easily detected in its preclinical phase, using office spirometry. Successful smoking cessation prevents further disease progression in most patients. Spirometry measures the ratio of the forced expiratory volume in the first second to the forced vital capacity (FEV₁/FVC), which is the most sensitive and specific test for detecting airflow limitation. Primary care practitioners see the majority of adult smokers, but few primary care practitioners currently have spirometers or regularly order spirometry for their smoker patients. Improvements in spirometry software have made it much easier to obtain good quality spirometry test sessions, thereby reducing the misclassification rate. Respiratory therapists and pulmonary function technologists can help primary care practitioners select good office spirometers for identifying chronic obstructive pulmonary disease and teach staff how to use spirometers correctly. Key words: spirometry, chronic obstructive pulmonary disease, COPD, screening [Respir Care 2003;48(12):1194–1201. © 2003 Daedalus Enterprises]
smoking cessation (a cost-effective intervention) prevents further disease progression in most patients. Though almost all hospitals have a pulmonary function testing (PFT) laboratory, and almost all allergy and pulmonary specialists have spirometers, less than half of primary care practitioners use spirometry in their practices. The American Association for Respiratory Care supports the National Lung Health Education Program (NLHEP) to promote the appropriate use of spirometry by primary care practitioners for the detection of COPD in adult smokers. However, screening for COPD remains controversial, since it has not yet been proven that the staff in primary care offices can attain the same low misclassification rate as can experienced and certified pulmonary function technologists who perform spirometry in PFT laboratories. A recent COPD workshop summary stated that “there are no data to indicate that screening spirometry is effective in directing management decisions or in improving COPD outcomes.”

### Criteria for Using Screening Tests

There is a big difference between using medical tests for screening versus case-finding (Table 1). An example of screening is a respiratory therapist (RT) setting up a booth at a county fair and offering spirometry to anyone who walks by and is interested. An example of case-finding is a family physician performing spirometry during an office visit for a 50-year-old smoker because the patient complains of a chronic morning cough. The physician then discusses the results with the patient and refers him or her to a local smoking-cessation program.

Several well-recognized criteria have been established for medical tests proposed for the early detection of disease:

1. The disease would progress and cause substantial morbidity or mortality.
2. Treatment is available that is more effective when used at the early stage, before the development of symptoms, than when used after the symptoms develop.
3. There is a feasible, affordable, safe, and relatively simple testing method that is accurate enough to avoid producing large numbers of false-positive or false-negative results.
4. There is an action plan that minimizes adverse effects.

Case-finding spirometry for COPD among adult smokers fulfills all of those criteria. However, the evidence for two of the criteria remains weak. Though spirometry is accurate (has a low misclassification rate) in the PFT laboratory setting, what little is published suggests that this may not be true in the primary care setting. Also, it has not been conclusively demonstrated that adding spirometry to a smoking-cessation program substantially increases the 12-month smoking-cessation rate.

### A Comparison of Tests for Detecting COPD

Several tests other than the spirometrically-measured ratio of forced expiratory volume in the first second to forced vital capacity (FEV1/FVC) have been advocated for detecting COPD. Airflow limitation also prolongs the forced expiratory time, which can be measured during the physical examination simply by using a stethoscope and timing the expiration. It is likely that the patient has airflow limitation if the forced expiratory time substantially exceeds 6 seconds. However, there is a high misclassification rate.

Peak expiratory flow (PEF) is low in patients who have airflow limitation. Current clinical practice guidelines recommend PEF measurements for asthma management but not for helping to make the diagnosis of asthma. Advantages of the PEF test include that it requires only a simple, safe, hand-held device that typically costs less than $30, and the required exhalation maneuver is less than half a second. On the other hand, PEF is relatively insensitive to mild airflow limitation; PEF is very dependent on patient effort; PEF has about twice as much intersubject and intrasubject variability as FEV1; and PEF meters are much less accurate than spirometers.

Airway obstruction increases airway resistance, which can be measured using a body plethysmograph or a forced oscillator or interrupter. However, these instruments are much more expensive than spirometers, and the results (airway resistance, specific conductance of the airways, and total respiratory resistance) are much more variable than the FEV1/FVC, resulting in a higher misclassification rate for airflow limitation.

Chronic airflow limitation also causes hyperinflation (high functional residual capacity, residual volume, and ratio of residual volume to total lung capacity). Hyperinflation can be measured by helium dilution, nitrogen washout, body plethysmography, and lung imaging techniques (chest radiographs and computed tomography scans). The pulmonary function instruments used to measure hyperinflation are expensive, large, and require specialized train-
COPD causes maldistribution of ventilation, as measured by closing volume, the slope of phase III of the nitrogen washout curve, or aerosol dispersion tests. However, maldistribution of ventilation is poorly associated with airflow limitation, and nitrogen meters are relatively expensive and notoriously difficult to maintain. And the aerosol dispersion test is currently an unproven technology that does not have adequate clinical validation.

COPD also reduces gas transfer and thus lowers diffusing capacity (D LCO ) and blood oxygen levels during exercise (oxygen desaturation). D LCO is an excellent test for differentiating COPD from asthma (D LCO is low in moderate-to-severe COPD, whereas D LCO is normal-to-high in asthma). However, D LCO instruments cost $20,000–$30,000 and often have problems with accuracy and repeatability, and thus are rarely found in the out-patient setting. In our experience, blood oxygen saturation measured via pulse oximetry during exercise may be more sensitive to gas exchange abnormalities than is a resting D LCO measurement, but oximetry is plagued by false-positive readings due to motion artifact, even with the latest pulse oximeters. Oximetry is also less specific and less sensitive than FEV 1 /FVC for detecting airflow limitation.

The mechanism by which smoking and other noxious particles and gases cause COPD is inflammation of the airways and lung parenchyma. Various aspects of airway inflammation can now be measured noninvasively and with little patient effort or risk, via induced sputum (cell counts and cytokine levels) and tests of exhaled gas and vapors. However, collection of induced sputum requires 12 min of breathing ultrasonically nebulized hypertonic saline, followed by 20 min of preparation of the sputum sample and (currently expensive) cytokine analyses in a specialized laboratory. The relationship between the short-term degree of inflammation and the degree of airflow limitation and COPD morbidity and mortality is unknown, making these new tests currently unsuitable for COPD case-finding. These tests remain research tools at present.

The GOLD Standard

An accepted reference standard—a gold standard—must be available to distinguish between true positive and false positive results from a new test. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) report authoritatively states: “COPD is a disease state characterized by airflow limitation that is not fully reversible. . . . Airflow limitation is measured by spirometry, as this is the most widely available, reproducible test of lung function.”

Airflow limitation (also known as airway obstruction) in adult ever-smokers is defined by the GOLD document as an FEV 1 /FVC of < 70%. The severity of COPD is classified (in stages I–IV) according to the patient’s percent-of-predicted FEV 1 .

Spirometric measurement of FEV 1 /FVC (or FEV 1 /FEV 0 ) will probably remain the best test for COPD case-finding for at least the next 5 years, so the remainder of this review will discuss how to minimize the misclassification rate in COPD case-finding among adult patients when using spirometry.

Minimizing Misclassification Is an Important Goal

The accuracy of a test for screening or case-finding is measured in terms of 2 indices: sensitivity and specificity. A test with poor sensitivity will miss cases, producing false negative results, whereas a test with poor specificity will result in healthy persons being told that they have the disease (a false positive result). The sum of the false negative rate and the false positive rate is the overall misclassification rate. Five percent is usually considered an acceptable misclassification rate for most medical tests; thus 1 in 20 patients will get an inaccurate test result. The American Thoracic Society (ATS) recommends using the fifth percentile of the distribution of lung function as the lower limit of the normal range (LLN). This means that from a group of 100 people with healthy lungs, 5 will get a false positive spirometry result. Ideally, however, the LLN threshold should be chosen to produce a false-positive rate and false-negative rate that is acceptable after considering the physical, psychological, social, and economic consequences of both types of errors.

Use of the GOLD recommendation of 70% as the LLN for FEV 1 /FVC will increase the misclassification rate when testing for airflow limitation. Instead, the LLN should be age-specific and gender-specific, per 1991 ATS recommendations. All published population-based studies of spirometry show that FEV 1 /FVC decreases with age in the
healthy subset of the population, suggesting that aging alone causes slightly progressive airflow limitation. Whereas 70% is about right for a 50-year-old man, the 5th percentile LLN for a 20-year-old is about 75%, and for an 80-year-old it is 65% (Fig. 1). The use of a fixed 70% threshold causes considerable misclassification when applied to either young adults (among whom the false-negative rate would be high) or elderly adults (among whom the false-positive rate would be high).22–24 The GOLD committee probably chose 70% for simplicity, as an easy-to-remember "rule of thumb." It does reduce the need for calculations (regression equations, nomograms, or look-up tables) to determine whether a patient has airflow limitation. The 70% LLN perhaps has some merit for third-world countries, where most doctors cannot afford a spirometer with a microprocessor or personal computer.

Accept Uncertainty

Clinicians much prefer to view test results as black-or-white, abnormal or normal, but such a stubborn stance increases the misclassification rate. Results that are near the rather arbitrary threshold (the LLN) should instead be interpreted with uncertainty (Fig. 2 and Table 2). For instance, if the LLN for the FEV₁/FVC is 73% and the patient’s FEV₁/FVC is 72%, it should not be stated with confidence that the patient has airflow limitation and COPD. On the other hand, if the patient’s FEV₁/FVC is 55% and FEV₁ is 60% of predicted, then even if the quality of the spirometry test was suboptimal, one can state with confidence that the patient has COPD.

Spirometers Need Improvements for Use by Primary Care Practitioners

The 2003 GOLD document correctly emphasized that "maximal patient effort in performing the test is required to avoid errors in diagnosis and management" and that "the supervisor of the test needs training in its effective performance." The NLHEP document goes much further, requiring that office spirometers incorporate software that automatically checks maneuver acceptability and then checks for repeatable FEV₁ and FVC before the test session is considered complete.4 It also recommends that manufacturers take an active role enabling office staff to learn how to use spirometers by providing easy-to-understand educational materials such as audiovisual instructional aids. Almost all spirometers now sold in the United States incorporate an internal microprocessor or are connected to...
a personal computer. The primary function of the computer is to measure the spirometry results from each maneuver, calculate the percent-of-predicted values, and format a printed report. The software can be enhanced (quality-control software) to help the spirometry technologist obtain better quality test sessions.13,25 Each maneuver is checked for acceptability and error messages are displayed. As additional maneuvers are performed, the repeatability of the FEV₁ and FVC are determined and a quality grade (A–F) is computed for the test session. The goal is to obtain an A or B grade by performing additional acceptable FVC maneuvers. Such software may not be necessary for experienced technologists working in a hospital-based PFT laboratory; they have considerable experience coaching patients and recognize unacceptable maneuvers from the flow-volume and volume-time graphs.26 However, the NLHEP group recognized that quality-control software is essential for those who perform spirometry relatively infrequently in a primary care office setting. An NLHEP committee, composed primarily of RTs, will soon test office spirometers and their quality-control software, using a standardized checklist based on NLHEP and ATS recommendations. The results will be posted on the NLHEP web site as a guide for those planning to purchase an office spirometer.

The NLHEP spirometry document makes office spirometry faster and easier by enabling the use of the 6-second forced expiratory volume maneuver (FEV₆), which is slightly smaller than the FVC or the slow VC among healthy subjects, so the NHANES III reference equations must be used.21 FEV₆ is more reproducible than the traditional FVC. The FEV₁/FEV₆ is just as good as the traditional FEV₁/FVC for diagnosing airflow limitation and for predicting FEV₁ decline in smokers.27 The use of FEV₆ reduces technologist and patient fatigue and also has less risk of syncope than the prolonged FVC maneuvers, which often last 20–30 seconds before a volume-time plateau is achieved with a COPD or asthma patient.

The Potential Positive Impact of Widespread Spirometry Screening

Does spirometry testing enhance smoking-cessation rate? Studies of lung function testing in the general population have had mixed results, with some showing no effect and others suggesting that knowledge of an abnormal lung function test doubled the likelihood of quitting smoking, even when no other interventions were applied.28 A 1997 review29 concluded that spirometry meets all the criteria for a test for the early detection of COPD, except that there is no conclusive evidence that spirometry adds to the efficacy of standard smoking-cessation advice that is based on current clinical practice guidelines.30 The single randomized controlled trial that addressed this issue included 923 Italian smokers; the researchers found a 1-year quit rate of 6.5% among those who received counseling with spirometry, 5.5% among those with counseling alone, and 4.5% among those who received only brief physician advice.31 Those rates do not differ significantly; however, only half of the study participants who were asked to visit a laboratory for spirometry testing ever did so, and there was no evidence that the spirometry results were even discussed with those who performed the test; therefore the study probably had inadequate power to show a difference (a type II error). However, even a 1% improvement in smoking-cessation rate, as was found in the Italian study, would result in a very large number of lives saved each year in the United States.

Potential Adverse Effects of Spirometry Screening

As with any other medical test, there are tangible and intangible costs. Adverse effects may occur (1) due to the procedure itself, (2) due to the investigation of abnormal results, or (3) due to the treatment of detected abnormalities or diseases.11,12 The economic costs of the spirometry test includes the cost of the instrument and the cost of personnel time (both training and testing). Office spirometers currently cost about $1,000 and about $10 for personnel time (including initial training time) and disposable supplies, per test. We estimate that accurate office spirometers will soon cost less than $500. There are no adverse effects from spirometry testing, other than occasional minor discomfort, which lasts for a few minutes.

Investigation and confirmation of abnormal spirometry results cost both time and money and may result in psychological and social harm to a few. Diagnostic spirometry to confirm airflow obstruction costs $20–$60 in a hospital-based PFT laboratory. The estimated travel time, waiting time, and testing time spent by the patient is 1–3 hours. The possible psychological impact of being labeled as “ill,” by self and others, following a positive (including false-positive) test could lead to alterations in lifestyle, work, and seeking medical attention.

Another important potential adverse effect is the unmeasured risk of reinforcing the smoking habit in some of the 4 out of 5 adult smokers who are told they have normal spirometry. However, the clinician should counteract this possibility by telling the patient that normal spirometry does not mean that the patient’s high risk of dying from a heart attack, lung cancer, or other smoking related diseases are substantially reduced, and, therefore, smoking cessation remains very important.

Finally, the risk of an adverse effect caused by the intervention for COPD—smoking cessation—is very small. The adverse effects of over-the-counter nicotine replacement therapies are minor. Successful smoking cessation tends to lead to an increase in body weight.32 but the slight
increase in medical risk from minor weight gain is far exceeded by the benefits of quitting smoking, including reduced morbidity and mortality and savings in cigarette and cleaning costs.

The Action Plan

Early intervention following early identification of lung function abnormalities can lead to improved smoking cessation, workplace or home environmental changes, and increased awareness of and attention to cancer, cardiac health, and nonpulmonary health issues associated with abnormal lung function. Early identification of lung function abnormalities in relatively asymptomatic patients may provide “teachable moments” (ie, moments when the patient has increased awareness of medical risks and a more positive response to medical education and intervention). Such moments may increase the success of smoking cessation efforts and enhance opportunities for other preventive therapies to minimize the patient’s risk.

Once an abnormality has been detected, an action plan must follow. Even when test quality is good, diagnostic spirometry is highly recommended to confirm the initial abnormal spirometry findings prior to initiating an expensive work-up or interventions with negative economic consequences, such as a recommendation to change jobs. When airway obstruction is identified in a smoker, the primary intervention is smoking cessation, since it is currently the only intervention that has been demonstrated to improve the decline in lung function and thereby reduce the risk of disabling COPD. In asymptomatic smokers with airway obstruction, smoking cessation is the only intervention with proven value. Referral to a subspecialist for further diagnostic testing should be considered in some cases. In the event that a patient with airway obstruction continues to smoke, renewed/increased effort to assist with smoking cessation is essential.

Current Spirometry Screening Programs

The Polish national program for early diagnosis and prevention of COPD started in 2001, in 12 cities. Over 11,000 ever-smokers were tested in pulmonary out-patient clinics, and about one fourth of those had airflow limitation (10% mild, 10% moderate, 5% severe). They all received physician advice to stop smoking. About 9% had the nonspecific pattern of low FVC without airway obstruction. Two thirds of the participants returned for a follow-up visit about 12 months later. Half of those who returned had airflow limitation during the baseline examination. The biochemically verified 12-month smoking-cessation rates showed that those with moderate to severe airflow limitation were twice as likely to have quit as those without airway obstruction (17% vs 8.4% quit rates). The independent predictors of success were a late start of smoking, older age, fewer pack-years, and a lower FEV1. There was no gender difference in quit rates.

A pilot program of COPD screening was recently completed in the Netherlands. In 2 semi-rural general practice offices, 651 adult current smokers underwent spirometry. By ATS criteria 85% had acceptable test session quality, and of those, 18% had an abnormally low FEV1. Patients reporting a chronic cough were about twice as likely as the other smokers to have abnormal spirometry, and nearly half of the smokers over the age of 60 had abnormal spirometry. The researchers estimated that in each practice when 1 adult smoker was tested every day, 1 case of COPD was found per week.

In Vermont a state-wide COPD case-finding program began in 2001, funded by the American Lung Association of Vermont. Primary care practitioners were surveyed about their knowledge and use of spirometry. Slightly more than half owned spirometers, could correctly diagnose airflow limitation, and were aware of the NLHEP guidelines. Many did not realize the strong association of FEV1 with cardiovascular disease. Reasons for not performing spirometry included lack of education, logistic barriers, and concerns about cost and reimbursement (unpublished data). A subset of practices participated in 1-hour workshops designed to provide education about and practical instruction on use of spirometers. Preliminary results suggest that knowledge and use of spirometry have improved in the participant practices. The program highlights the importance of continuing spirometry education.

In 2002 the GlaxoSmithKline Respiratory Institute began planning Project Spirometry, a program designed to get primary care practitioners acquainted with office spirometry. The GlaxoSmithKline Respiratory Institute contracted with AlphaMedica (a medical communications firm) to produce 4 different educational materials, which were completed in July 2003: a booklet for primary care practitioners called “Office Spirometry”; a videotape and DVD (with physician continuing-education credit) called “Practice With the Experts”; a booklet with 12 patient vignettes and spirometry results, each followed by questions and answers; and a booklet and videotape (with available nursing continuing-education credit) called “Measurable Differences in Respiratory Care,” which was designed to teach nurses, nurse practitioners, physician assistants, and respiratory technologists how to perform spirometry. GlaxoSmithKline Respiratory Institute representatives have identified over 1,500 primary care practitioners in the United States who are interested in the program. The physician and an office staff person designated to perform spirometry will each complete the continuing-education course, and then a spirometer will be provided to them for a 60-day period. Over 1,500 spirometers were purchased for the program, and the spirometer software has been customized...
Strategies for Screening for Chronic Obstructive Pulmonary Disease

According to NLHEP guidelines, Project Spirometry will be the largest COPD case-finding program ever attempted.

The Value of Respiratory Therapists Working With Local Primary Care Practitioners

RTs and pulmonary function technologists can add value by facilitating COPD case-finding in their own communities. RTs can advise primary care office staff in the purchase of spirometers and help staff learn how to use them correctly. Primary care practitioners can benefit by taking advantage of the many services RTs can provide for their patients with lung disease, such as pulmonary rehabilitation programs, chronic disease management programs (eg, for COPD, asthma, sleep apnea, cystic fibrosis), smoking-cessation programs, and long-term oxygen therapy services.

Summary

COPD case-finding is worthwhile if (1) a currently smoking adult patient seen in a health care setting has any respiratory symptom, (2) good quality spirometry is done, (3) the result is interpreted correctly, and (4) the patient is referred to an effective local smoking-cessation program.

References

Discussion

MacIntyre: Let me ask you a physiology question. David Mannino described a group of COPD patients who don’t have obstruction but do have what I heard you call “restriction,” and I want to make sure I understand what that really means. Is it true restriction, implying some kind of fibrotic or interstitial process? Or is it what I think may be more likely, a small-airway phenomenon causing a small vital capacity? If that were the case, nitrogen washout lung volumes would probably show an enlarged residual volume encroaching on the vital capacity. So what I’m asking is, is this “restriction” you describe just another manifestation of airway obstruction, or is it a true restrictive disease?

Enright: We don’t know from the NHANES data because they didn’t take chest radiographs or measure lung volumes or DLCO [diffusing capacity of the lung for carbon monoxide], so the term “restriction” in our report means a low FVC with a normal FEV1/FVC. These are not patients with COPD or airways obstruction; these are persons from a sample of the general population who had low FVC.

REFERENCE


ers who have any respiratory symptom. Do you think we could take out “any respiratory symptom” and just use “all smokers”? Enright: Any respiratory symptom doubles the risk of having airflow limitation. Certainly, we could have set the age threshold at 35-years-or-older rather than 45-years-or-older. There’s a continuum of risk in smokers, but because we don’t yet have the evidence that spirometry has a low false-positive and false-negative rate in the primary care setting, I think that for now we should only recommend it for the highest-risk patients. The NLHEP document is vague regarding the need for a respiratory symptom.

MacIntyre: Barry [Make], would you do spirometry with all smokers, regardless of symptoms? Probably at least two thirds of them will have normal spirometry. What are you going to tell those normal-spirometry people? The only therapeutic thing they can do is stop smoking. But they should stop smoking anyway. These normal-spirometry people scare me because I’m afraid that they’re going to get the wrong message—that their lungs are tough enough to allow continued smoking. They’re among those that Sam Giordano calls “leather people,” and they’ll think they can continue their 2 or 3 packs a day because their lungs have been shown to be “healthy” enough to handle it.

Make: That’s a good question, Neil. We should remember that cigarette smokers are at risk for a number of diseases in addition to COPD. To a patient who smokes but has normal spirometry, I would say, “We’ve evaluated you for one smoking-related illness, and fortunately you don’t have COPD. However, you are still at risk for heart disease, lung cancer, and other diseases.” Informing patients that their spirometry is normal doesn’t stop smoking-cessation efforts and continued monitoring for multiple other diseases the patient is at risk for. In addition, spirometry is only one motivator to inform patients of the need to discontinue smoking.

I have a question related to education for health care providers. Are we doing enough education for all health care providers about the role and use of spirometry? NLHEP and other organizations are very interested in educating physicians about spirometry. We have an initiative to develop spirometry education programs for medical students. This year we will develop content, and next year we propose to develop curriculum materials that we will provide free of charge to all medical and osteopathic schools to assist in medical student education about spirometry. No one has previously targeted medical students or thought they are a key population. Hopefully, education during their formative years will translate into routine use of spirometry when they become practicing physicians.

Enright: That’s excellent. That’s where it needs to start. It’s just amazing that during the last 12 months Glaxo (through AlphaMedica, a medical communications firm in New York) has put probably $2 million into similar materials for practicing primary care physicians. This continuing medical education program, a component of “Project Spirometry,” recently became available in the United States.

Make: One issue we didn’t address is the widespread use of questionnaires to potentially assist in the diagnosis of lung disease. That was a subject of several abstracts at this year’s American Thoracic Society meeting, and questionnaires may be a useful screening or case-finding tool that physicians can easily use in their practices. Do you have any sense as to whether non-physiologic measures such as questionnaires are likely to be useful?

Enright: If you have any of the cardinal respiratory symptoms, your COPD risk is doubled as a cigarette smoker. You can also use age and gender to rate the risk and put that into a model. So questionnaires certainly have some place. But I think as soon as a patient sees a physician in a health care setting, it is worthwhile and inexpensive to make an objective measurement of airflow and/or airway obstruction.

Make: That’s my bias, too: that questionnaires may be useful when the patient doesn’t see the physician. Once the patient sees the physician, they should do the spirometry.

Enright: I agree.

Hansen-Flaschen: I like your idea of recognizing uncertainty in diagnosing COPD within some range of FEV₁/FVC, such as 65 to 75%. That would describe a large, important group of people. When we have an uncertain first-level screening test, we often go to a second-level investigatory or confirmatory test. So if we were to rethink the way we do this, and define an uncertain zone, what would be the second-level test for those patients?

Enright: I think the current answer is that they need to go to a pulmonary function lab or pulmonologist or allergist—someone who’s experienced with spirometry, to have it confirmed, although that’s not practical in most settings, and it’s very expensive.

Hansen-Flaschen: But what use is it to confirm the spirometry results? If you have the spirometry re-done in a reference laboratory and they also find borderline spirometry numbers, would you look next to functional residual capacity, residual volume, symptoms, or what for second-level confirmation?

Enright: The physician should weigh the consequences of a false-positive versus a false-negative result, and that should push him or her to...
ward the correct action. For instance, our therapies for mild airway obstruction in a cigarette smoker are quite limited right now; I don’t think there’s currently an indication for Serevent, ipratropium, or tiotropium in that group. There’s certainly no evidence that those drugs alter the disease outcome. So I think you have to look at the patients’ co-morbidities and the down side of them continuing smoking versus the down side of the cost and likelihood of success in the smoking-cessation program in your community.

**Shrake:** One of the deficiencies, I believe, in this whole process is the lack of good local smoking-cessation programs that primary care physicians and pulmonologists can refer smokers to. One of the strategies the American Association for Respiratory Care has looked at is an Internet-based smoking-cessation program that would provide materials that could be tied to the nicotine replacement therapy products, which could be tied to an Internet “chat room” for people to help each other during the cessation process, and then perhaps tie that through the Association’s network to some local people who could provide some face-to-face contact. I’d like your thoughts on the appropriateness of that type of program, or challenge the point that there’s even a deficiency of programs.

**Enright:** About 5 years ago one of the industry sponsors put together a wonderful professional group called “Professionally Assisted Cessation Therapy” (PACT). An Internet resource would certainly be effective for a certain segment of the population, but not for blue-collar people who don’t get on the Internet every night. A toll-free telephone number, for instance, at which a person could enter his zip code and be referred to a local cessation program that follows the World Health Organization guidelines would be very effective but currently does not exist. NLHEP and the American Thoracic Society are working very closely with the American Association for Respiratory Care to encourage respiratory therapists to become resource people for primary care physicians in their community, and this is one of the things they can definitely add that we as pulmonologists have failed to do or don’t have the time to do.

**Hill:** Paul, I think your bottom-line conclusion was that screening spirometry is worthwhile, but I’d like to play the devil’s advocate. We don’t know that spirometry adds anything to smoking cessation, and we don’t know that the quality of spirometry done by primary care practitioners is any good; we know that often it isn’t much good. Thus, the conclusion would be that screening spirometry has not been shown to be worthwhile. Is that fair to say?

**Enright:** Well, you saw all the caveats. We’re working closely with the spirometer manufacturers to get them to improve their software to detect poor spirometry maneuvers and poor test sessions. Poor-quality results should not be interpreted by the spirometer as they currently are—they are just tossed out, which increases the number of tests where the patient and the clinician are frustrated by not having a result.

One should realize that there’s uncertainty in screening tests, much like in hypertension, hypercholesterolemia, and most other medical conditions with which the health risks are on a continuum. When done inexpensively in a mass marketplace you should be uncertain about some results and not worry when your cholesterol bounces 20 points up or down.