Knowledge and Use of Office Spirometry for the Detection of Chronic Obstructive Pulmonary Disease by Primary Care Physicians

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BACKGROUND: The importance of office spirometry has been strongly advocated in the pulmonary community, but whether its importance is recognized and accepted by primary care physicians is less well established. METHODS: To assess primary care physicians' knowledge and use of office spirometry for the detection of chronic obstructive pulmonary disease, we conducted a brief mail survey on the local practice of office spirometry, barriers to performing office spirometry, and general knowledge about spirometry. We also provided 60-min educational workshops to assess whether such an approach would increase spirometry testing or perceptions about spirometry. RESULTS: Twenty-nine of 57 (51%) primary care offices responded to the survey. Of these, 66% owned their own spirometer. The most common reasons for not performing spirometry were uncertainty about the impact of the test (41%), physician and staff unfamiliarity (38%), and lack of training (34%). Twenty-one respondents participated in the workshops. In the 3 months following the workshops, the number of spirometry tests increased by 59% (p = 0.004). After the workshops, the proportion of clinics that reported reasons for not performing the test decreased by 13% (p = 0.01), but important barriers to performing office spirometry were still present, including physician and staff unfamiliarity (22%), uncertain interpretation of results (22%), time (22%), and reimbursement (22%). CONCLUSIONS: The general knowledge and use of office spirometry in the primary care community is poor, but can be improved, at least in the short-term, by a simple educational workshop. *Key words: spirometry, survey, primary care, screening, chronic obstructive pulmonary disease.* [Respir Care 2005;50(12):1639–1648. © 2005 Daedalus Enterprises]

Introduction

Chronic obstructive pulmonary disease (COPD) is a major public health problem. It is currently the fourth leading cause of death worldwide and is predicted to be the third leading cause by 2020.[1] To identify and target patients with silent COPD for treatment, especially through smoking cessation,[2] the National Lung Health Education Program (NLHEP) has recommended that all smokers age 45 years and older have *screening* lung function measured by simple spirometry.[3–5] In addition, the NLHEP advocates more widespread use of *diagnostic* office spirometry for patients with respiratory symptoms, and to provide a global assessment of health.[3–5]

The NLHEP motto is "Test your lungs. Know your numbers." These "numbers" are the forced expiratory volume in the first second (FEV_1) and the forced vital capacity (FVC, or its surrogate, the FEV_6). These 2 numbers currently define COPD, as specified by the joint statement of the National Institutes of Health and World Health Or-

ganization in their Global Initiative for Chronic Obstructive Lung Disease.[6] Yet most smokers and patients with COPD are not aware of their FEV_1 and FVC, and most primary care physicians do not measure these values with their patients who smoke.[7]

The goal of the present study was to assess the level of knowledge and use of spirometry for the detection of COPD by primary care practices in our local medical community. We also sought to determine the feasibility of improving knowledge and use by providing brief educational workshops that could easily be incorporated into the busy daily schedules of these practices. As part of this training we purchased spirometers for practices that did not own them. This project was not designed to assess adherence to the NLHEP guidelines, but rather was conceived as a pilot study upon which to base a future, more comprehensive evaluation of techniques to improve knowledge and use of spirometry in the primary care setting.

Methods

The study was designed to collect information by mailed questionnaire, and also to solicit interest in participating in a structured workshop on office spirometry. The study was approved and a waiver of informed consent was provided by the University of Vermont's institutional review board.

Sampling Frame and Questionnaire

All primary care medical groups that care for adults within the region associated with our local Area Health Education Center were contacted by mail and asked to participate. A cover letter was addressed to the office manager, who was asked to pass it and the questionnaire on to a representative physician in the group. The 250 physicians within the local Area Health Education Center area serve a population of approximately 250,000 people within the referral area of Fletcher Allen Health Care, the teaching hospital of the University of Vermont College of Medicine. The medical groups were mailed a 2-page survey (see Appendix) that asked questions about (1) the size, nature, and location of their practice; (2) the prevalence of patients in their group who smoke and have COPD; (3) the local practice of performing office spirometry, including how often it is performed, for which patients, by whom, the use of quality control, and barriers to performance; and (4) general knowledge about spirometry interpretation, other national education programs, and the importance of FEV_1 in relation to COPD, lung cancer, and cardiovascular disease. The survey questions were modeled after similar items in studies of spirometry use in asthma[8] and in screening for COPD.[9]

Workshop Intervention and Assessment

If respondents indicated that they were interested in participating in the workshop, then they were contacted by telephone and a date was arranged. A pulmonary physician and respiratory therapist provided the workshop, which was targeted toward the physicians and any other healthcare providers within the practice who were involved with spirometry. The workshop consisted of a 30-min slide presentation on the epidemiology and health burden of COPD; the relation of FEV_1 to important health outcomes such as death from COPD, lung cancer, and cardiovascular disease; the NLHEP rationale and guidelines; and the basics of spirometry testing, quality control, and interpretation. Another 30 min was spent on providing hands-on experience with the spirometer. We performed actual testing on participants and discussed and demonstrated key quality-control issues, such as performance of maximum inspiratory and expiratory effort, sharp peak flow, and sufficient exhalation. If an office did not own a spirometer, we purchased one for them with a grant from the American Lung Association of Vermont.

Offices participating in the workshops were asked to complete a daily log of spirometry testing or to maintain a record of spirometry billings, to document the number of spirometry tests they performed over the 3 months following the workshop. That number was compared to the number of tests performed during the 3-months before the workshop, based on a review of billing records. At the end of the 3-month post-workshop period, a brief follow-up questionnaire (see Appendix) was forwarded to the physician within each practice who responded to the initial survey. We informed the physician that we would be calling shortly to receive their answers, as well as any additional feedback they had about the program. The questionnaire asked about reasons for not performing spirometry, their overall comfort with interpreting simple spirometry (on a scale of 1–5, with 1 being "very comfortable" and 5 being "not at all comfortable"), and to rate the program's success (on a scale of 1–5, with 1 being "not at all successful" and 5 being "very successful"). During the follow-up telephone call, we also asked that the spirometry log data or billing records, as well as copies of spirograms from random patients tested in the 3-month period following the workshop, be sent for review. The same pulmonary study physician evaluated the spirograms for quality according to American Thoracic Society standards.[10]

Statistics

Since this was primarily an exploratory study, no power calculation was performed to predetermine the sample size. Descriptive data are summarized using mean ± SD or median (25–27% interquartile range), as determined by

sample distribution. There were 2 primary outcomes of this study. The first had to do with the survey data. We used Fischer's exact test to determine the associations between owning a spirometer or participating in the workshop and (1) size of practice ($\leq$ 20 patients/d vs > 20 patients/d), (2) internal medicine or family practice specialty, (3) private or academic affiliation, (4) prevalence of spirometry testing by group (dichotomized as < or $\geq$ 50% of patients who smoke, with respiratory symptoms, with asthma, and with COPD), and (5) reported barriers to performing spirometry.

The second primary outcome was the impact of the spirometry workshop on the number of tests performed and the prevalence of perceived barriers to performing spirometry. We used the Wilcoxon rank sum test to evaluate the differences between the number of spirometry tests performed before and after the workshop. We used the paired t test to evaluate the differences in the percentage of clinics that reported barriers to performing spirometry before and after the workshop. A 2-tailed p value of < 0.05 was considered statistically significant.

Results

Clinical Practice Data

The survey was mailed to 57 eligible clinics. A total of 29 practices responded after an initial and 2 repeat mailings of the cover letter and questionnaire, yielding a response rate of 51%.

Table 1 shows the characteristics of the survey respondents. There was equal representation of internal medicine and family practice groups, and most were small, private practices. The physician-reported prevalence of smoking and COPD was similar to statewide and national statistics.[11,12] Two thirds of the respondent practices owned spirometers, but there were no associations between ownership and size of practice, internal medicine versus family practice orientation, or affiliation with the academic medical center.

Many different personnel performed spirometry in the 19 practices that owned a spirometer. Only 8 practices (42%) claimed to have any training, which usually consisted of an educational in-service review by a respiratory technologist who performs pulmonary function tests at the local medical center. Nine of the 19 (47%) practices stated that they performed quality control, with a frequency specified as anywhere from daily to yearly; the remaining practices left this question blank or marked "unknown." Quality-control methods usually consisted of a yearly technical inspection by the local hospital technical support staff, including calibration with a standard 3-L syringe.[10] In addition, some practices also performed periodic calibration using their own syringe.

As seen in Table 1, the respondent practices reported performing spirometry on relatively few of their patients who smoke and 50% of their patients who have respiratory symptoms, COPD, or asthma. There were no statistically significant associations between the prevalence of testing and whether a clinic owned a spirometer, was internal medicine or family practice oriented, was affiliated with the academic medical center, or elected to participate in the workshop. Less than half the respondents (45%) knew to use FEV_1, FVC, and FEV_1/FVC in diagnosing airflow limitation. Similarly, only half were aware of the NLHEP. Only 3 of 21 practices used the lung age concept in their smoking-cessation efforts. The respondents were less comfortable with interpreting spirometry values than electrocardiogram tracings or cholesterol levels. While nearly two thirds recognized the strong association between FEV_1 and mortality from COPD and lung cancer, only half were aware of the association between FEV_1 and heart disease and stroke.

Barriers to Performing Office Spirometry

Table 2 lists reasons the respondents gave for not performing spirometry. The primary reasons related to physician concerns about the impact of the test, lack of familiarity and training, reimbursement, cost, and quality control. Not surprisingly, ownership of a spirometer was inversely associated with cost being cited as a barrier to performance ($p < 0.001$), but there were no other associations between any other barriers and ownership of a spirometer, internal medicine or family practice orientation, private or academic affiliation, or participation in the workshop.

Impact of Spirometry Workshop

Of the 29 practices that responded to the survey, 21 were interested in the workshop. Of these, 6 practices did not own a spirometer, and a spirometer was purchased for each of them. The workshops were attended by as few as 2 and as many as a dozen health-care providers, depending on the size of the practice, and always involved at least one physician and the office personnel who were involved in performing spirometry. The primary impact of the workshop was gauged by the difference in the number of spirometry tests performed in the 3 months before versus the 3 months after the workshop. As shown in Figure 1, all of the 14 practices for whom there were both pre- and post-workshop data increased their spirometry testing. The reasons the other 7 practices were not included in this analysis were: an estimated, rather than actual, number of tests was provided ($n = 2$); the spirometer was nonfunctional ($n = 3$); or spirometry testing was not yet routinely performed ($n = 2$, both of which were clinics provided with a new spirometer). Among the groups who already owned a spi-

Table 1. Characteristics of Survey Clinic Respondents ($n = 29$)

Characteristic	Distribution*
Primary care specialty (%)	
Internal medicine	48
Family practice	45
Both	7
Private practice (%)	74
Number of physicians (median and interquartile range)	3 (2–4)
Estimated number of patients per clinic (median and interquartile range)	7,350 (4,625–17,100)
Estimated patient visits per day (median and interquartile range)	20 (20–58)
Estimated patient tobacco use (mean ± SD %)	21 ± 11
Estimated percent of patients who have COPD (median and interquartile range)	5 (5–10)
Clinics ($n = 19$) that own a spirometer (%)	66
Personnel who perform spirometry (%)†	
Registered nurse	58
Medical assistant	26
Licensed practical nurse	11
Physician	11
Physician assistant	5
Respiratory therapist	5
Clinics that have received spirometry training (%)	42
Clinics that perform spirometry quality control (%)	47
Percent of patients for whom spirometry was performed (median and interquartile range)‡	
Patients who smoke ($n = 20$)	20 (10–50)
Patients with respiratory symptoms ($n = 24$)	50 (20–74)
Patients with COPD ($n = 25$)	50 (25–85)
Patients with asthma ($n = 25$)	50 (40–78)
Percent of respondents who diagnose airflow limitation by†	
FEV_1	62
FEV_1, FVC, FEV_1/FVC	45
FEF_{25-75}	10
ABG	3
Percent of respondents aware of the following national education programs§	
Hypertension (NHBPEP)	100
Cholesterol (NCEP)	90
Asthma (NAEPP)	79
Lung health (NLHEP)	53
Comfort level with interpreting spirometry results (rating and interquartile range)‖	
Electrocardiogram	1 (1–2)
Cholesterol level	1 (1–1)
Spirometry	2 (1–3)
Percent of respondents who said that the following statements are true	
FEV_1 correlates with mortality from COPD and lung cancer	62
FEV_1 correlates with mortality from heart disease and stroke	48

*Proportion of clinics cited as percentage; prevalence of characteristic among clinics cited as percentage expressed as mean ± SD or median and interquartile range, based on data distribution.
†Percentages add up to more than 100% because of multiple responses.
‡Not all clinics responded to each part of this question, and some clinics that were not performing spirometry did not answer this question. n = number of clinics that responded.
§See the National Institutes of Health Web site (http://www.nih.gov) for descriptions of these programs.
‖Rating scale: 1 (very comfortable) to 5 (not at all comfortable).
FEV_1 = forced expiratory volume in the first second
FVC = forced vital capacity
FEF_{25-75} = forced expiratory flow during the middle half of the forced vital capacity
ABG = arterial blood gas analysis
NHBPEP = National High Blood Pressure Education Program, NCEP = National Cholesterol Education Program
NAEPP = National Asthma Education and Prevention Program, NLHEP = National Lung Health Education Program.

rometer ($n =10$) there was a median increase from 6 to 16 tests during the 3-month period, representing a change of 59% (interquartile range in percentage change = 31–312%, $p = 0.004$). This is equivalent to an average (median)

Table 2. Reasons Cited for Not Performing Office Spirometry

Reasons	All Clinics (n = 29) (%)	Workshop Clinics Before (n = 21) (%)	Workshop Clinics After* (n = 18) (%)
Uncertain impact of test	41	43	11
Physician/staff unfamiliarity	38	38	22
Lack of training	34	33	6
Reimbursement	28	24	22
Equipment costs	28	19	0
Quality control	28	29	17
Time	17	10	22
Uncertain interpretation of results	17	19	22
Easier at hospital	17	19	6
Uncertain explanation of results	10	14	0
Patient reluctance	0	0	22
Staffing (not listed on survey)	0	0	6

*The overall percentage of workshop clinics citing any of the reasons declined by 13 ± 12% (p = 0.01).
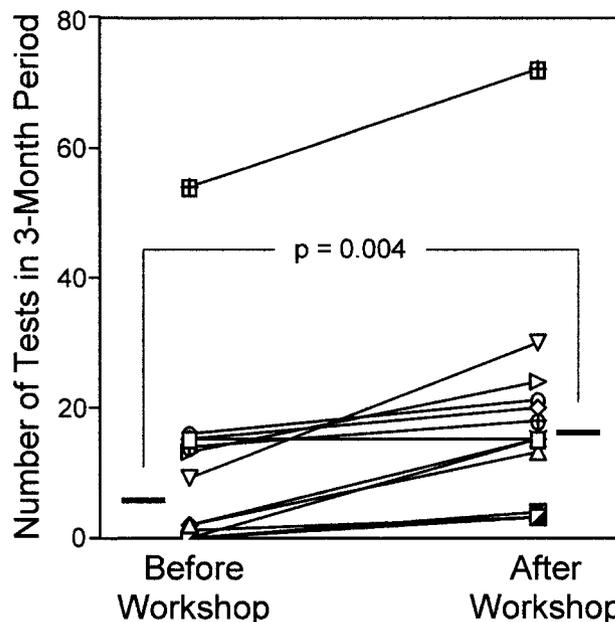

Fig. 1. Impact of spirometry workshop on performance of spirometry. The figure shows the number of spirometry tests performed by 14 clinics in the 3-month periods before and after the workshop. Each point and line represents an individual primary care practice. When we analyzed only those practices that already owned a spirometer (n = 10), we found that there was a median increase, from 6 to 16 tests (horizontal bars), representing a change of 59% (interquartile range in percentage change = 31–312%, p = 0.004). Notice that one clinic performed many more tests than the other clinics, both before and after the workshop. That practice is an adult internal medicine group that is very knowledgeable about spirometry and performs it frequently with their patients.

weekly increase in spirometry from 1 test every 2 weeks to 1 test every week.

To measure quality control, 74 spirograms were submitted for review. We judged acceptability based on the data provided in accordance with American Thoracic Society standards[10] whenever possible. Overall, 72% of the spirograms revealed acceptable data. All the spirograms allowed us to examine the presence of artifacts, exhalation time, and development of a volume plateau. Back-extrapolation error was not reported for any of the spirograms. We assessed good peak flow by visual inspection of the flow-volume (sharp peak) and volume-time (no hesitancy) plots. Using these methods, we identified the major problems as poor peak flow (15%) or unsatisfactory plateau (12%). Fifty-nine percent of the spirograms reported data on measurement variability for FEV_1, FVC, and peak flow. Based on these data, we found poor reproducibility in 7% of the spirograms. We noted technical difficulties in about 2% of spirograms, and many tracings exhibited more than one problem.

With regard to barriers to testing and interpretation, reasons for not performing spirometry were provided by 18 of the 21 groups who had participated in the workshops (the other 3 did not provide follow-up information) (see Table 2). The overall proportion of clinics citing any reason for not performing spirometry decreased by 13 ± 12% (p = 0.01). Following the workshops, the primary reasons for not performing spirometry were reimbursement, time, lack of familiarity with testing, and uncertainty with interpretation of results, although unfamiliarity and other issues were cited less commonly after the workshop. Interestingly, patient reluctance was a more common reason for not performing spirometry after the workshop. Although it is a subjective measure, confidence with spirometry interpretation increased to the levels seen with interpretation of electrocardiogram and cholesterol results (post-workshop score = 1, interquartile range = 1–2), although the change was not statistically significant. Overall, the workshops were rated very successful (score = 5, interquartile range = 4–5).

Discussion

The main purpose of this study was to assess the general knowledge and use of spirometry among primary care physicians in our local medical community. The response rate to the initial survey was 51%, despite repeated mailings. Of the groups that did return the survey, only 66% owned a spirometer, and on average only 50% of patients with COPD or asthma had spirometry testing, by physician self-reported estimates. The main reasons cited for not per-

forming spirometry included logistical issues and physician uncertainty about many aspects of the test. Awareness of the NLHEP was poor, compared to awareness of other similar national education programs. A focused, 1-hour workshop on spirometry improved the respondent practices' general knowledge about spirometry testing and interpretation, and increased the short-term frequency of spirometry testing. Quality-control and continued obstacles to regular testing remained important problems. However, the participants expressed a high level of enthusiasm and thought the educational program was very worthwhile.

The study results underscore a lack of awareness about or a lack of acceptance of lung-function testing. Spirometry is a test that is not widely used or appreciated,[7,8] despite the strong epidemiological evidence demonstrating an association between reduced lung function and important clinical outcomes.[12,13] The explanation for this may be understood by considering factors identified by Cabana and colleagues[14] that relate to why physicians do not follow clinical practice guidelines. Although this study was not intended to assess adherence to the NLHEP guidelines per se, these factors appear to apply to our study. These factors include lack of awareness or familiarity with the test, negative attitudes toward testing, and barriers to implementation.[14] For instance, many physicians are simply not aware of the strong associations between lung function and important health outcomes. This lack of awareness is concerning, in view of the large health burden that COPD presents to patients and society.[3,4,6,15–18] Measures of lung function are also key elements in stratifying patients into different treatment strategies, for both COPD[6] and asthma.[19] Moreover, early COPD detection and smoking-cessation are essential to controlling disease progression.[2] Spirometry can adequately screen high-risk individuals for silent airflow limitation,[3,15,16,18,20–22] and numerous studies have now identified airflow limitation as strongly associated with general health status.[12,13,17] Yet public awareness and physician appreciation of this subject appears to pale in comparison to more familiar diseases such as heart disease, stroke, and cancer.

Another reason spirometry is not more commonly performed is physician lack of familiarity with the testing and interpretation. Spirometry is underutilized not only by physicians who care for patients who smoke and have respiratory symptoms,[7] but also by physicians who care for patients with asthma.[8] In the study by O'Dowd and colleagues,[8] the factors most strongly associated with primary care physicians performing spirometry with their asthmatic patients were owning their own spirometer, being adequately trained to perform and interpret the test, and believing that the data are important for accurate diagnosis. A recent survey of primary care physicians' spirometry interpretations found that one third of tests were interpreted incorrectly.[23] Even after a focused, albeit brief, work-

shop, participants in our study still felt uncomfortable with interpretation. Fortunately, one study has shown computerized interpretation algorithms to be accurate in 92% of spirograms.[24] As discussed by Irvin,[25] the problems with familiarity and understanding may stem from the way in which pulmonary physiology is taught during medical school and residency. Based on our experience in the workshops, physicians and allied health personnel were quite pleased to have someone explain in simple terms what spirometry is and how the results relate to important clinical issues. It may be that they found themselves with an important opportunity for putting into practice what may have been theoretical knowledge.

Of course, accurate interpretation of results cannot happen without good-quality testing. Performing adequate spirometry remains a challenge, as was shown by the variable quality of the tests we reviewed, and as has been documented by Eaton and colleagues.[26] The issue of quality control is especially important, given the wide variety of health-care workers, as revealed in our survey, who perform office spirometry. However, modern office spirometers are accurate,[24] and quality control is monitored automatically by simple algorithms, so, with practice and attention, we believe that test quality can be adequately maintained. The NLHEP now offers a formal review process designed to certify that office spirometers meet the NLHEP guidelines (see http://www.nlhep.org).

Many practices cited uncertainty about the impact of the results as a reason for not performing spirometry. A recent study suggested that spirometry results do impact clinical decision making by general practitioners.[27] Literature on the subject of using spirometry as an aid to smoking cessation is mixed;[15] indeed, only 4 studies have directly addressed the issue; two found that knowledge of FEV_1 enhanced the smoking cessation rate,[28,29] and two found that it did not.[30,31] Another recent study by Gorecka and colleagues[20] suggested that knowledge of spirometry values enhances smoking cessation, but the study did not address the issue directly. One reason for the apparent failure of spirometry to significantly impact smoking cessation may be that the results are not conveyed effectively to the patient.[16] If the patient doesn't understand the meaning of spirometry values in the same way they are educated about cholesterol or hypertension, for example, then the impact of knowing their lung-function values will be less profound.

Finally, there are many barriers to performing spirometry in primary care, such as time, cost, and reimbursement. Performing adequate spirometry initially takes a substantial amount of time (up to 15 min), considering the patient preparation and repeated attempts necessary in order to obtain reliable results. However, many of the practices surveyed in our study were performing spirometry regularly, and a recent study from Belgium supports the

feasibility of introducing office spirometry into general practice.[22] We speculate that the reason patient reluctance became more of an obstacle *after* the workshop was because patients were then offered spirometry and had the opportunity to decline, whereas before the workshop they were not even offered the test. Regarding cost, most of the practices were surprised to learn that the cost for a basic office spirometry system was much lower than they expected (approximately $1,000), and, likewise, that reimbursement was such that the machine could pay for itself within a few months, depending on the size and nature of the practice. The lack of direct experience, short follow-up period, and absence of supportive data from other local practices may be some of the reasons why reimbursement remained an important barrier to performance after the workshop.

Several important limitations of this study must be considered, keeping in mind that the study was observational and designed primarily to pilot the workshop. First, only 51% of the target population responded to the survey, despite our attempts to maximize return of surveys through the use of short questionnaires and repeated mailings.[32] This response rate is equivalent to the return rate from a similar group in a recent study of spirometry use in asthma.[8] However, this relatively low response rate indicates that our population may not be representative of the primary care community in general, creating the potential for important selection bias.

Second, the main tool for data collection was a simple survey that had not undergone validation by comparison of findings with objective data or by repeated measures with the same population. However, we used similar methodology to that of another spirometry survey that had been validated.[8]

Third, the primary outcome measure of the success of the workshops was the number of spirometry tests performed in a relatively short time frame, and that result would not necessarily be sustained. In addition, the sources for these data were subject to recording and classification error. Further, we did not stratify the tests by underlying diagnosis, indication, or repeated tests on the same subjects. Instead, our goal was to choose a simple measure for which we could obtain at least some objective measure of spirometry performance.

Fourth, the measure of quality control used was based on interpretation of spirograms provided by participating clinics. Although clinics were asked to send random samples of spirograms, there was no control over the selection of the tests sent for review, and there may have been a selection bias in favor of good performance.

Finally, although we performed simple statistical analyses between the variables, we realize that their validity is uncertain, given the limited sample size of this study.

Despite these limitations, it is clear that any type of intervention must continue to address not only the general knowledge aspects of spirometry but also the logistical issues that clearly hinder spirometry testing. Among these are issues of time and reimbursement. Physicians and office staff may need to be creative to design ways to incorporate spirometry testing into the normal patient visit. For example, a trained health-care provider could perform spirometry as an intake procedure in selected patients, during the routine gathering of information, including chief complaint, allergies, medications, and vital signs. Alternatively, perhaps a separate day or time could be set aside regularly to measure spirometry on eligible patients. Administrative personnel need to learn the appropriate coding and billing procedures to be reimbursed for the test. Almost 20% of the respondent clinics stated that it was easier to send patients to the local hospital pulmonary function laboratory. This approach certainly remains an alternative and would still provide important information on lung function, if only the physician would request it.

Conclusions

Knowledge and use of office spirometry for detecting COPD was generally poor among the primary care practices in our study. However, brief educational workshops were well received and appeared to have at least some short-term impact on the knowledge and use of spirometry. This type of workshop and other educational endeavors will be necessary before spirometry becomes more widely accepted in the primary care setting. In addition, efforts must be made to reduce some of the logistical barriers to implementation, especially in the realm of time and reimbursement. Convincing primary care providers that spirometry is useful will also require clinical evidence of effectiveness, such as spirometry's impact on clinical decision making and smoking cessation.

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Appendix

Office Spirometry Questionnaire

(Only one respondent per practice)   Date _____

Conducted by David Kaminsky MD, from Fletcher Allen Health Care and the University of Vermont, as part of a research project on the use of office spirometry, supported by the American Lung Association of Vermont.

You do not need to provide your name, and your responses will be kept confidential. This survey is voluntary; you do not have to participate in this survey if you do not want to.

1. What is the name of your office practice? _____ Address _____ Tel _____
   (Optional, but I will need your name, address and telephone number if you are interested in participating in the program.)

2. How big is your office practice? Physicians _____ Other health-care professionals _____ Nurses _____ Patient population _____

3. How many patients do you see in a typical day? _____

4. Approximately what percentage of your patients are current smokers? _____

5. Approximately what percentage of your patients have COPD? _____

6. What type of primary care practice are you? Internal medicine ___ Family medicine ___ Both ___

7. To which hospital do you admit patients? _____

8. Do you own a spirometer? Yes ___ No ___ If not, are you currently considering purchasing one? Yes ___ No ___

9. Who usually performs the spirometry testing in your office? _____

10. Approximately what percentage of each patient category below has spirometry measured?
    All patients _____ Patients who smoke _____ Patients with chronic respiratory symptoms _____
    Patients with COPD _____ Patients with asthma _____ Other _____

11. Has anyone in your practice received formal training in spirometry? Yes ___ No ___ If so, who? _____

12. If you own a spirometer, how often do you do quality-control evaluation of it? _____

13. The diagnosis of airflow obstruction is made on the basis of which numbers below?
    ABG _____ FEV_1 _____ FEV_1, FVC, FEV_1/FVC _____ FEF_{25-75} _____

14. How comfortable are you at interpreting:

	Very		A Little		Not At All
Simple spirometry?	1	2	3	4	5
Basic EKG patterns?	1	2	3	4	5
Cholesterol levels?	1	2	3	4	5

15. What are the reasons that you might not perform office spirometry?
    _____ Too time consuming _____ Concerns about testing quality or accuracy _____ Not enough training
    _____ Concerns about reimbursement _____ Equipment too costly _____ Physician or staff unfamiliarity
    _____ Patient reluctance _____ Physician uncertainty about interpretation of results
    _____ Physician uncertainty about explanation of results to patients
    _____ Physician uncertainty about impact of results on clinical practice
    _____ Easier to send patients to hospital pulmonary function lab
    Other: _____

16. Which tools do you use to help your patients who smoke quit smoking?
    ___ Group programs ___ Hypnosis ___ Individual counseling ___ Acupuncture ___ Books, tapes, Internet
    ___ "Lung age" concept ___ Nicotine replacement ___ Bupropion (Zyban) Other _____

17. Have you ever heard of:
    The National Lung Health Education Program? ____ Yes ____ No
    The National Cholesterol Education Program? ____ Yes ____ No
    The National High Blood Pressure Guidelines? ____ Yes ____ No
    The National Asthma Education Program? ____ Yes ____ No

18. Are you familiar with the American Thoracic Society guidelines on spirometry? ____ Yes ____ No

19. FEV_1 correlates with mortality from lung cancer and COPD. _____ True _____ False

20. FEV_1 correlates with mortality from heart disease and stroke. _____ True _____ False

21. Are you interested in participating in the office spirometry workshop program? ____ Yes ____ No

Thank you very much for your participation! Please return this questionnaire in the self-addressed, stamped envelope provided.

(Continued)

Appendix (continued)

Office Spirometry Follow-up Questionnaire

Dear Participant:

I will be contacting you by telephone in the next few weeks to gather some final data on the office spirometry project. The following are some questions that I would like you to have on hand during our 5-minute conversation, in order to facilitate the process. Thanks in advance for participating!

Sincerely,

David Kaminsky MD

Questions for Telephone Follow-Up

1. How comfortable are you at interpreting:

	Very		A Little		Not At All
Simple spirometry?	1	2	3	4	5
Basic EKG patterns?	1	2	3	4	5
Cholesterol levels?	1	2	3	4	5

2. What are the reasons that you might not perform office spirometry?

_____ Too time consuming   _____ Concerns about testing quality or accuracy   _____ Not enough training
_____ Concerns about reimbursement   _____ Equipment too costly   _____ Physician or staff unfamiliarity
_____ Patient reluctance   _____ Physician uncertainty about interpretation of results
_____ Physician uncertainty about explanation of results to patients
_____ Physician uncertainty about impact of results on clinical practice
_____ Easier to send patients to hospital pulmonary function lab
Other: _____

3. How would you rate this program?
    1 - Worthless
    2 - Only fair
    3 - Neutral
    4 - Pretty good
    5 - Very effective, worthwhile

Many thanks!