Discrepancy in the Use of Confirmatory Tests in Patients Hospitalized With the Diagnosis of Chronic Obstructive Pulmonary Disease or Congestive Heart Failure

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OBJECTIVE: To determine the prevalence of confirmatory use of spirometry in patients admitted to a tertiary-care facility with the diagnosis of chronic obstructive pulmonary disease (COPD), including those with respiratory failure, and compare that to the use of confirmatory 2-dimensional echocardiography (2-D echo) in patients admitted with the diagnosis of congestive heart failure (CHF), to determine preferential confirmatory testing practices. SETTING: Academic tertiary-care hospital. METHODS: A 6-month retrospective review of charts of patients with a primary or secondary discharge diagnosis of COPD, respiratory failure, and CHF, using the appropriate International Classification of Diseases, Ninth Revision, Clinical Modification codes. Pulmonary function and echocardiography laboratory databases were reviewed to determine if the patients had had spirometry or 2-D echo performed during the 8 years prior to the study period. RESULTS: Five hundred fifty-three patients were discharged with the diagnosis of COPD, and 173 patients (31%) had had spirometry. In contrast, 789 patients had the diagnosis of CHF, and a larger proportion of them (619 patients, 78%) had had 2-D echo ($p < 0.001$). Only 35% of the patients with respiratory failure and COPD had spirometry performed. There were a total of 219 patients with concomitant diagnoses of COPD and CHF. A majority of them (48%) had a 2-D echo as the only confirmatory test, 74 (34%) had both tests performed, 4 (2%) had spirometry only, and 36 (16%) had neither test performed. Of the patients with a diagnosis of COPD who had spirometry, 30% had spirometry findings consistent with restrictive or normal physiology. CONCLUSIONS: A large proportion of patients hospitalized with the diagnosis of COPD have never had a confirmatory test, including those with presumably advanced disease. Compared to patients with CHF, patients with COPD are less likely to have had the confirmatory test performed, even when both conditions coexist. Many patients with the clinical diagnosis of COPD have an inconsistent physiologic diagnosis. To impact the increasingly important problem of COPD, we must raise awareness of the need to confirm its diagnosis and severity with spirometry. *Key words: chronic obstructive pulmonary disease, pulmonary function test, congestive heart failure, echocardiogram, spirometry, diagnosis.* [Respir Care 2006;51(10):1120–1124.

Introduction

Chronic obstructive pulmonary disease (COPD) is an under-diagnosed disease. The National Health and Nutrition Examination Survey (NHANES III) estimated that 24 million adults in the United States are afflicted with COPD, with measured evidence of impaired lung function, but only 10 million reported physician-diagnosed COPD.[1] This is particularly troubling, since COPD is the fourth leading cause of death in the United States, with a rising mortality rate that will place it as the third leading cause of death by the year 2020. The hallmark of the disease is poorly reversible airflow obstruction, and confirmation of the diag-

See the Related Editorial on Page 1116

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nosis requires spirometry, with a post-bronchodilator ratio of forced expiratory volume in the first second to forced vital capacity (FEV_1/FVC) of ≤ 0.7.[2,3]

The prevalence of airflow obstruction is not only common within the general United States population, but also within the hospital setting. In a recent study,[4] 26% of patients admitted to a general medical service had airway obstruction, as defined above, and only 35% of them had a previously established diagnosis of obstructive lung disease. Those authors recommended the use of screening spirometry to improve the diagnosis of obstructive lung disease.

In clinical practice we have observed patients who had a documented clinical diagnosis of COPD without previous or subsequent confirmatory spirometry; the diagnosis was presumably based on the presence of dyspnea, cough, and/or sputum production in patients with a history of cigarette smoking. We have also been impressed that in many patients the disease is advanced enough to require admission to the medical intensive care unit for ventilatory support secondary to respiratory failure, and yet there is neither documented confirmation of their underlying lung disease nor documentation of the degree of severity of their condition. In other words, these patients were "clinically diagnosed" with COPD but did not have a confirmatory pulmonary function test (PFT). This contrasts with the impression that most patients with a clinical diagnosis of congestive heart failure (CHF—a chronic disease very similar to COPD) are frequently evaluated and treated on the basis of a confirmatory echocardiogram.

This study was designed to determine the prevalence of confirmatory testing among patients with a documented diagnosis of COPD admitted to a tertiary-care facility. To test whether this is a disease-specific pattern of behavior, we also compared the utilization of 2-dimensional echocardiography (2-D echo) to confirm the clinical diagnosis of CHF.

Methods

We retrospectively identified patients discharged from our hospital during the 6-month period of June 1st through November 30th, 2003, who had a primary or secondary diagnosis of COPD, using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes 496 (chronic airway obstruction not elsewhere classified) and 491.21 (obstructive chronic bronchitis with exacerbation). With patients readmitted to the hospital during the study period, we only considered the first discharge. Using the generated patient list, the pulmonary function laboratory database was cross-referenced to determine the number of patients with a diagnosis of COPD who had confirmatory spirometry. The pulmonary function laboratory in our hospital is the only reference laboratory used for the network of primary-care and subspecialty physicians with admitting privileges to our institution. The PFT results retrieved were limited to the last 8 years prior to the study period. PFTs were reviewed and interpreted by one of us (VMPP), following American Thoracic Society/European Respiratory Society (ATS/ERS) criteria.[3]

We performed a similar retrospective analysis of the same time period to evaluate the use of 2-D echo in patients with a diagnosis of CHF. In this analysis, CHF was defined as ICD-9-CM codes 428 through 428.9. The 2-D-echo data retrieved was also limited to the last 8 years. Patients with diagnoses of both COPD and CHF were then selected and the prevalence of confirmatory 2-D echo and/or spirometry was compared to assess any preferential confirmatory testing practices.

As a secondary analysis, we studied patients who had a discharge diagnosis of respiratory failure during the same 6-month period, and identified those who also had a documented diagnosis of COPD. We then reviewed the pulmonary function laboratory database to determine the number of patients who had a diagnosis of respiratory failure and COPD who had spirometry performed during the past 8 year period. The ICD-9-CM codes used for this analysis were 518.81, 518.83, 518.84, and 779.1, which correspond to respiratory failure (acute, chronic, acute on chronic, and endotracheal intubation, respectively).

The study protocol was presented to our institutional review board and was categorized as a quality-assurance study, so there was no need for patient consent.

Statistical Analysis

A chi-square test was used to determine if the difference between nominal categories was statistically significant. Fisher's exact test was used to confirm the chi-square test results for small frequencies ($n < 5$). A p value of < 0.05 was taken as statistically significant.

Results

During the study period there were 2,751 discharges assigned to the Department of Medicine, corresponding to 2,116 patients. Of these, 800 discharges had either a primary or a secondary diagnosis of COPD, representing 553

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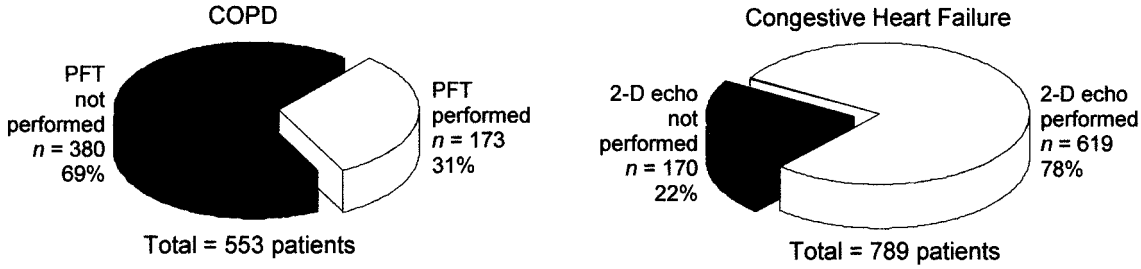

Fig. 1. Total number and percentage of patients with a clinical diagnosis of chronic obstructive pulmonary disease (COPD) or congestive heart failure (CHF) and the proportion of those patients who had a confirmatory pulmonary function test (PFT) or 2-dimensional echocardiogram (2-D echo) within 8 years of the diagnosis. The difference is highly statistically significant ($p < 0.001$).

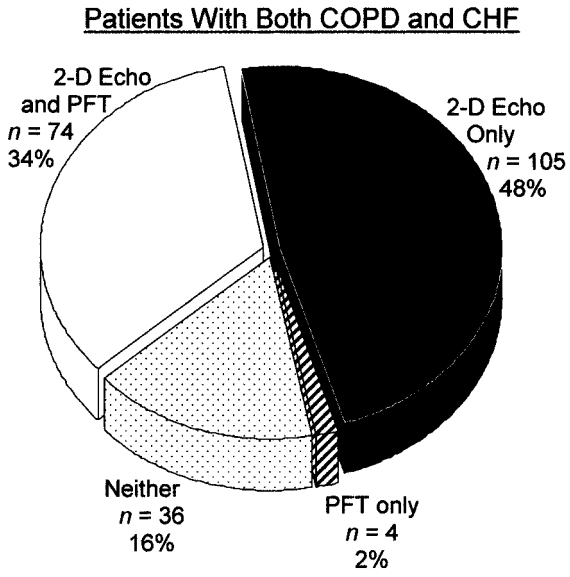

Fig. 2. In patients admitted with concomitant diagnoses of chronic obstructive pulmonary disease (COPD) and congestive hear failure (CHF) there was a significant difference in the proportion of patients who received the appropriate confirmatory test (pulmonary function testing [PFT] or 2-dimensional echocardiogram [2-D Echo]).

patients. There were 173 (31%) patients with documented spirometry completed within 8 years. In contrast, there were 1,123 discharges with a diagnosis of CHF, corresponding to 789 individual patients. A much larger group of them (619 patients, 78%), had a 2-D echo within the same period. This difference is statistically significant ($p < 0.001$) (Fig. 1).

We found 219 patients with concomitant diagnoses of COPD and CHF. Of those, 105 (48%) had only a 2-D echo performed, 74 (34%) had both tests, 36 (16%) had neither test, and 4 (2%) had only the spirometry test (Fig. 2). The chi-square and Fisher's exact test also showed a statistical significant difference among these categories.

The PFT results from the 173 patients with the diagnosis of COPD were reviewed. The results had to meet ATS/ERS standards. Of these 173 patients, 123 (71%) had obstructive lung physiology. Interestingly, 33 (19%) had spirometry results consistent with restrictive lung impairment, and 17 (10%) had normal spirometry. These 2 groups had an $FEV_1/FVC > 0.7$, thereby excluding airflow limitation. Of the patients with obstructive lung physiology, 6 (5%) had stage 1 disease, 51 (41%) had stage 2 disease, 54 (44%) had stage 3 disease, and 12 (10%) had stage 4 disease, according to the ATS/ERS guidelines.[3]

During the study period, 113 patients had a diagnosis of respiratory failure. Of these patients, 39 (35%) had a documented discharge diagnosis of COPD. Only a small percentage of these COPD patients (26%) had had a PFT (50% stages 3 and 4).

Discussion

This study has 2 important findings. First, a large proportion of patients admitted to a tertiary-care hospital with a clinical diagnosis of COPD did not have confirmatory spirometry to substantiate the diagnosis. This lack of confirmatory testing held true even for those patients with advanced lung disease leading to respiratory failure. Second, this pattern seems to be disease-specific, because there was a statistically significant difference in the ordering of confirmatory testing between patients admitted with the diagnosis of CHF and those with diagnosis of COPD. When both conditions coexisted in the same patient, the disparity in ordering a confirmatory test still persisted.

Based on epidemiologic surveys, the prevalence of COPD may be different in many countries around the world,[1,5–7] but it is frequently under-diagnosed. This problem is not limited to the United States; several reports from other countries have also found a large proportion of the population with spirometry-proven COPD but no physician diagnosis.[5–6] In Spain,[5] 9.1% of the randomly selected population had COPD, but only 22% of them were previously diagnosed.

Little is known about the behavioral pattern of disease approach at the clinical level. A study of general medicine

practices in Wales[8] showed that spirometric confirmation of COPD varied widely (0–100%, with a median of 37%), 58% of the practices were comfortable with the use of spirometers, and 34% were confident with the interpretation. Our study provides some insight into the magnitude of the problem, even in centers where the concentration of resources would predict favorable patterns of diagnostic behavior. Despite the publication of guidelines by important international societies[2,3] that require spirometry to confirm the COPD diagnosis, in practice many patients are still diagnosed only on the basis of clinical symptoms. It seems that there is a disconnect among clinicians between the recommendations for COPD diagnosis and implementation of spirometry.

Although regrettable, it is somewhat understandable that asymptomatic patients at risk for COPD may not be screened with spirometry, because many clinicians still adhere to the concept that patients who smoke will not be helped by a determination of an abnormal spirometry. This behavior may also be supported by a recent report from the Agency for Healthcare Research and Quality,[9] which was requested by the American Thoracic Society's Spirometry Task Force to determine the evidence to support the use of routine spirometry as a tool in the practice of primary-care physicians.[10] The agency concluded, based on currently available data, that spirometry for COPD case-finding among adults who have persistent respiratory symptoms or exposure to risk factors will add greatly to overall healthcare cost without providing much benefit to patients. However, once patients reach a degree of obstruction severe enough to cause respiratory failure, it is very worrisome that only 20% of them had a confirmatory spirometry performed within 8 years of their admission. Spirometry would have helped establish the diagnosis and probably would have influenced their therapy earlier, as treatment is guided in large part by the degree of airflow limitation,[2,3] and the group with more severe disease is the most likely to benefit from interventions.[3,9] The findings suggest a need to disseminate information on the way the COPD diagnosis is confirmed and the practical value of assessing the degree of airflow obstruction. The problem seems to be worsening; indeed, a survey of over 1,000 physicians indicated that over 40% of recent graduates do not use spirometry and are not aware of COPD guidelines and recommendations.[11]

There is a perception among some medical practitioners that symptoms and signs of COPD in patients with smoking history are probably good enough to make a COPD diagnosis. It is documented that practitioners are more likely to predict obstructive lung disease than a restrictive condition, before PFTs are performed.[12] This may provide them with an erroneous level of confidence. Our study suggests a need to change the current approach, because it appears that the recommendations of the respiratory societies have done little to influence practice. There are also no clear guidelines regarding how often a PFT should be ordered[13] or how the results guide the therapy.[3] Finally, current algorithms for pharmacologic therapy are mostly symptom-guided and, although correct, may convey the impression that the spirometric determinations of the degree of obstruction may not be important.

Equally disturbing is the fact that close to 20% of the patients diagnosed as having COPD who had spirometry actually had restrictive lung physiology, and another 10% had normal lung function. This indicates that, even with the results at hand, many patients are given an incorrect diagnosis, with possibly inappropriate treatment. It is possible that the information provided by the reading of the PFT results was not communicated adequately, or that, once received, it was ignored. We believe there is a great need to review the way PFT results are reported and communicated so that clinicians and patients can benefit from the correct interpretation.[8]

The severity of the problem of disconnection between recommendations and implementation in COPD management is highlighted by its contrast with the use of another confirmatory test, the 2-D echo, in a similarly prevalent disease, CHF. In contrast to patients with COPD, 78% of the patients admitted to our center with a diagnosis of CHF had a 2-D-echo confirmatory test during the same time period. Further, when patients were admitted with both COPD and CHF, there was a significant difference in the behavioral pattern of confirmatory testing. Patients with both diagnoses were 20 times more likely to get 2-D echo than spirometry, which suggests that clinicians are much more likely to consider the indications for a 2-D echo than a spirometry in patients in whom the diagnosis may be suggested by confounding symptoms. Several possibilities may explain these findings. First, the use of 2-D echo for diagnosing CHF may be more prevalent than the use of spirometry for diagnosing COPD because 2-D echo results help differentiate systolic from diastolic dysfunction, which is a useful guide for treatment and prognosis. However, for the clinician the implications of obstructive versus restrictive physiology are enormous, in terms of diagnosis, therapy, and prognosis, and this is a reason in and of itself to obtain a PFT.[9] Second, it is possible that certain differences between the tests could influence the pattern of use. The 2-D echo is effort-independent and may be performed with the patient in stable or unstable clinical condition, which facilitates its use during the admission. However, once the patient is stable, there is no reason that a spirometry should not be conducted and reviewed to test the clinical suspicion of COPD. Spirometry is simple, reliable, inexpensive, and in every way better standardized than the subjective characteristic of the 2-D echo.

The most important limitation of the present study is its retrospective nature. However, the hard criteria used for

the diagnosis of COPD, respiratory failure, and CHF, and our detailed review of the PFT results and 2-D-echo reports for the same period provide a solid basis for our findings. In addition the fact that both the pulmonary function and noninvasive cardiac laboratories are the only referral laboratories for physicians in our hospital network strengthens our findings. We do agree that a prospective analysis might shed light on referral patterns, test selection, and the influence of policies on health-care practice.

Conclusions

Taken together, our findings are important. For a disease that is to become the world's third most frequent cause of death by the year 2020, the lack of confirmation of its clinical diagnosis is worrisome. With appropriate policies, such as simplification of spirometry reporting, reimbursement for in-hospital testing, and COPD education for clinicians, it may be possible to reverse the current under-diagnosis of COPD.

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