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Validation of self-reported chronic obstructive pulmonary disease among patients in the ED[★]

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Abstract

Background—To determine whether the self-reported diagnosis of adults who present to the emergency department (ED) with an acute exacerbation of either asthma or chronic obstructive pulmonary disease (COPD) is validated by medical record review.

Methods—This is cross-sectional study of 78 consecutive adults, 55 years and older, presenting to 3 EDs with symptoms suggestive of an exacerbation of asthma or COPD. We used current spirometric guidelines for a “spirometrically validated” diagnosis of COPD (eg, postbronchodilator forced expiratory volume in 1 second/forced ventilatory capacity <70%). Patients without office spirometry result were classified with COPD using clinical validation based on at least one of the following: primary care physician diagnosis of COPD, chronic bronchitis, or emphysema in the medical record or chest radiography, chest computed tomography, or arterial blood gas (ABG) diagnostic of COPD.

Results—Among 60 patients who self-reported diagnosis of COPD, 98% (95% confidence interval, 89–100) had clinically validated or spirometrically validated COPD. In addition, 83% (95% confidence interval, 59–96) of patients who reported either asthma only or no respiratory disease had clinically validated or spirometrically validated COPD. In no case was the chest radiograph or the ABG useful as a stand-alone test in establishing the diagnosis of COPD.

Conclusions—Patients 55 years and older presenting to the ED with acute asthma or COPD, even those with clinical symptoms but no diagnosis of COPD, are likely to have COPD. Clinicians should maintain a high index of suspicion for COPD when older asthma patients deny COPD.

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1. Background

Chronic obstructive pulmonary disease (COPD) is the fourth leading cause of death in the United States, and morbidity and mortality from COPD continue to rise in the United States and around the world [1]. In 2002, 118000 persons died of COPD-related illness in the United States, out of approximately 11.2 million persons with the disease [2].

In 2000, there were an estimated 1.5 million visits to the emergency department (ED) for acute exacerbation of COPD [3]. Chapman and colleagues [4] found that women were less likely than men to be diagnosed as COPD. In that survey, physicians diagnosed 65% of men as having COPD compared with only 49% of women, based on identical history and physical examination. Soriano and colleagues [5] studied National Health and Nutrition Examination Survey III data and found a surprisingly high rate of spirometry-proven airflow obstruction in patients 50 years or older and who were diagnosed with either asthma only (27%) or with no respiratory diagnosis (9%). Viegi and colleagues [6] also demonstrated the difficulty in proper classification of obstructive and nonobstructive COPD among 2 populations in Italy.

We sought to determine the magnitude of such misclassification of COPD diagnosis among ED patients.

2. Methods

2.1. Study sample

We conducted a cross-sectional study of adults 55 years and older presenting to 3 North American EDs with symptoms suggestive of an acute exacerbation of obstructive lung disease (OLD; eg, wheezing). Consecutive patients—enrolled between November 1999 and January 2000—underwent a structured interview that included medical and social history factors. We performed bedside spirometry—at the index ED visit—on all eligible patients following American Thoracic Society standards [7]. Self-reported OLD was determined based on the following question: “Has a doctor ever said that you have...asthma COPD, emphysema, or chronic bronchitis?” After the ED visit, the medical records of all patients were reviewed to determine whether they met criteria for the diagnosis of COPD. When necessary, primary care providers (PCPs) were contacted to ascertain information that would allow validation of the diagnosis of COPD. This study was approved by the institutional review boards of all 3 hospitals, and informed consent was obtained prospectively for each patient.

2.2. Validation of patient self-report of COPD

We attempted to validate the diagnosis of COPD for all enrolled patients using the following classification. A patient was classified as “spirometrically validated” COPD if there was a baseline office spirometry report demonstrating an obstructive pattern. Spirometry was classified according to the Global Initiative for Chronic Obstructive Lung Disease guidelines, which define moderate-to-severe COPD as forced expiratory volume in 1 second (FEV_1)/forced ventilatory capacity (FVC) less than 0.70, with FEV_1 less than 80% predicted [8]. For the purpose of our study, documentation of FEV_1 /FVC equal to or greater than 0.70 or FEV_1 equal to or greater than 80% predicted excluded validation of self-reported COPD. Because many patients with COPD lack spirometric data [9,10], we also created a classification of “clinically validated” COPD. Clinically validated COPD required a medical record diagnosis of COPD, emphysema, or chronic bronchitis by a PCP; a prior chest radiograph (CXR) or computed tomography (CT) scan that was interpreted as COPD or emphysema by a radiologist; or an arterial blood gas (obtained during a nonacute visit) that demonstrated a compensated respiratory acidosis.

2.3. Statistical analysis

The characteristics of the study population were presented as absolute counts, percentages, medians, 95% confidence intervals, and interquartile ranges (IQR). Associations between proportions were tested using χ^2 or Fisher exact test, as appropriate. The Kruskal-Wallis test was used to compare non-parametrically distributed continuous variables. A 2-tailed P value $< .05$ was defined as statistically significant. Stata 8 (College Station, Tex) statistical software was used for all analyses.

3. Results

3.1. Patients

Seventy-eight consecutive patients were enrolled at 3 EDs (Massachusetts General Hospital, Boston, Mass; Metro-Health Medical Center, Cleveland, Ohio; and University of Alberta, Edmonton, Alberta). Seventy-six patients (97%) had a medical record available for review. We contacted the PCP for the other 2 patients. Thirty-eight patients reported COPD only (including COPD, emphysema, or chronic bronchitis), 22 patients reported both asthma and COPD, 12 patients reported asthma only, and 6 patients denied both asthma and COPD but presented with symptoms suggestive of non-reversible OLD per research staff. Demographic and clinical characteristics of these self-report groups seem similar (Tables 1 and 2, respectively).

3.2. Validation

Fig. 1 demonstrates a flow diagram of the validation process. Among the 60 patients who self-reported any COPD diagnosis, office spirometry was available for 42 (70%) patients. Spirometry was diagnostic of nonreversible OLD in 39 (93%) patients. Clinically validated COPD classification was based on the following medical record or PCP contact data: A non-ED physician diagnosis of COPD was present for 58 (97%) of the 60 patients. Chest radiography was available for 57 (95%) patients, of which 36 (63%) were officially reported as COPD by a radiologist. Chest CT was available in 29 (48%) patients, of which 14 (48%) were officially reported as COPD by a radiologist. A stable ABG was available in 47 (78%) patients and demonstrated a compensated respiratory acidosis in 28 (60%). Thus, among the 60 patients reporting any COPD diagnosis, 58 (97%) had sufficient available medical record or PCP information to meet the clinical classification of COPD.

Among the 12 patients who self-reported asthma only, office spirometry was available for 10 patients (83%), of which 8 (80%) were diagnostic of nonreversible OLD. A non-ED physician diagnosis of COPD was present for 10 (83%) of the 12 patients who self-reported asthma only. Chest radiography was available for 12 (100%) patients, of which 9 (75%) were reported as COPD by a radiologist. Chest CT scans were available for 6 (50%) patients, of which 2 (33%) were reported as COPD by a radiologist. A resting ABG was available for 7 patients (50%), of which 1 (33%) was diagnostic for COPD.

Among the 6 patients who self-reported neither asthma nor COPD, office spirometry was available for 3 (50%) patients, of which 2 (67%) were diagnostic of COPD. A non-ED physician diagnosis of COPD was present for 3 (50%) of the 6 patients who denied either asthma or COPD. Chest radiography was available for 6 (100%) patients, of which 2 (33%) were reported as COPD by a radiologist. Chest CT scans were available for 2 (33%) patients, of which 1 (50%) was reported as COPD by a radiologist. A resting ABG was available for 3 (50%) patients, of which 1 (33%) was diagnostic of COPD.

Only one patient had the diagnosis of COPD validated without either a pulmonary function test (PFT) or past diagnosis, and that validation was based upon a CT scan of the chest that

showed emphysematous changes. In no case was the validation based on only an ABG or CXR *alone*.

In summary, for 59 (98% [95% CI: 89, 100]) of 60 patients who self-reported physician-diagnosed COPD, we identified spirometrically or clinically valid diagnostic criteria for COPD. Among 12 patients who reported asthma only, 11 (92%) could be classified as having COPD using the same criteria. Finally, among the 6 patients who denied physician diagnosis of asthma or COPD but were thought to have OLD by clinical ED staff, 4 (67%) could be classified as having COPD using the same criteria. Fifteen of 18 patients (83% [95% CI: 59, 96]) who reported either asthma only or no respiratory disease had clinically validated or spirometrically validated COPD.

3.3. Associated factors

Only one of the spirometric parameters performed in the ED—final FEV₁—was statistically associated with COPD validation in patients who denied having either asthma or COPD. Values were lower among spirometry-validated COPD versus spirometry-excluded COPD: 0.64 (IQR, 0.59-0.81) versus 1.49 (IQR, 0.79-1.71), respectively ($P = .05$). None of the other demographic or clinical variables were associated with COPD validation in this cohort (Table 3).

4. Discussion

Our data demonstrate that ED patients 55 years and older who present with symptoms suggestive of OLD and who self-report a physician diagnosis of COPD may be taken at their word. In this study, we were able to confirm the diagnosis through spirometry or other supporting criteria in 98% of patients. Moreover, this study suggests that patients with asthma in this age group are likely to have COPD, and this can be confirmed with similarly high precision. Finally, patients who deny both diseases not only are similar clinically to those with self-reported COPD but also have criteria for the diagnosis of COPD in their medical charts.

This finding is consistent with the study by Barr and colleagues [11], who found that participants in the Nurses' Health Study had high validation of their self-report of physician-diagnosed COPD. In that study, the authors reviewed 10% of a sample of 2790 cases and found that 78% of cases could be validated through review of physician diagnosis, CXR, or chest CT scan. Mannino and colleagues [12] analyzed National Health and Nutrition Examination Survey III data to determine the prevalence of low lung function in the general population. They defined low lung function as FEV₁ less than 80% predicted, FEV₁/FVC less than 0.7, and presence of respiratory symptoms. They found that 63.3% of subjects with documented low lung function had no prior or current diagnosis of OLD. Incidentally, the question used by Mannino et al to determine a prior or current diagnosis of OLD was the identical question we used in our study.

These findings are important for a number of reasons. First, clinicians should feel confident with their clinical diagnosis of COPD. Second, although the diagnosis of COPD may not always be found in the medical record, clues pointing in that direction may be. Finally, patients who are not aware of their diagnosis of COPD may be missing out on important treatment approaches and a very important incentive to stop smoking. Smoking cessation is currently the single most important modifiable risk factor for reduced lung function in adults [1].

As for future investigations of acute exacerbation of COPD in the ED, it seems reasonable to include all patients 55 and older who present with symptoms of OLD to avoid inappropriate exclusion of eligible patients [13].

4.1. Limitations

The major potential limitation of this study is the validation criteria used. Although we used the cut points for FEV₁ and FEV₁/FVC recommended by the recent COPD guidelines, the Global Initiative for Chronic Obstructive Lung Disease committees acknowledge that “these cut points have not been clinically validated” [8]. Nevertheless, these criteria have been widely promulgated, and only future research will support or refute their clinical validity. In the absence of spirometric evidence of COPD, we used other measures from the chart, such as physician diagnosis, ABG, CXR, and CT scans, to confirm the diagnosis. Our decision to use these other measures is based on the literature in COPD, but they have not been formally validated. These criteria have, however, been widely used in clinical practice as being “supportive” of a diagnosis of COPD. That being the case, we have not relied on either the ABG or the CXR alone to make a COPD diagnosis in this project.

The evidence upon which the diagnosis of COPD was confirmed was largely based on spirometry (available for 71% of all patients). When this direct measurement was unavailable, diagnosis could be confirmed following PCP chart review (88%) or radiologists’ interpretation of a CXR (60%; Fig. 1). Less frequently, other supportive evidence was used, such as blood gas compensatory measures (41%) and/or chest CT scan (22%). Based on the predominance of high-quality spirometric and radiographic evidence and the overlap of other supportive evidence, we believe the conclusions to be valid.

The other potential limitation of this study is that we used only 3 EDs in different cities, 2 in the United States and 1 in Canada. However, the rates of validation of COPD in both previously diagnosed and undiagnosed COPD patients were the same (data not shown).

4.2. Conclusions

In summary, patients 55 years and older who present to the ED with symptoms suggestive of an exacerbation of OLD should be suspected of having COPD, whether or not they admit to a history of COPD. Because so many of these individuals actually have COPD, they should be treated and referred accordingly. The clinical and research implications of this diagnostic misclassification await further investigation.

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Fig. 1.
Flow chart of medical record review and primary care physician validation of patient self-reported diagnosis of COPD. See text for definitions.

Table 1Demographics of study population according to self-reported diagnosis ^a

Characteristic	Any COPD diagnosis (n = 60)	Asthma only (n = 12)	Denies asthma and COPD (n = 6)	P value
Age, y	69 (62-76)	71 (63-82)	69 (67-78)	.61
Female	32 (53)	10 (83)	2 (33)	.08
Race/ethnicity				.002
White	55 (92)	6 (50)	3 (50)	
Black	4(7)	2(17)	1 (17)	
Hispanic	1 (0)	2 (17)	1 (17)	
Other	1 (2)	2 (17)	1 (17)	
Education				.97
58th grade	15 (26)	4 (33)	2 (33)	
Some high school	12 (21)	3 (25)	1 (17)	
High school graduate	18 (31)	2 (17)	2 (33)	
Any college	13 (22)	3 (25)	1 (17)	
Insurance				.87
Private	22 (37)	6 (50)	2 (33)	
Medicaid	3 (5)	1 (8)	1 (17)	
Other public	34 (57)	5 (42)	3 (50)	
None	1 (2)	0 (0)	0 (0)	
Smoking				<.001
Never	3 (5)	6 (50)	0 (0)	
Past	38 (63)	4 (33)	3 (50)	
Current	19 (32)	2 (17)	3 (50)	
Pack years				.002
<20	8 (14)	5 (83)	1 (17)	
20-50	20 (35)	0 (0)	3 (50)	
>50	29 (50)	1 (17)	2 (33)	
Body mass index, kg/m ² %	25.4 (20.7-29.2)	23.7 (21.8-30.6)	26.2 (23.5-27.4)	.85
Median household income, US\$	35841 (32180-42978)	40734 (33833-49138)	33919 (24949-42348)	.50

^aData are presented as n (%) or median (IQR).

Table 2Clinical signs on presentation to the ED by self-reported diagnosis of COPD ^a

Characteristic	Any COPD diagnosis (n = 60)	Asthma only (n = 12)	Denies asthma and COPD (n = 6)	P value
Respiratory rate	25 (22 to 32)	24 (21 to 34)	24 (20 to 24)	.58
O ₂ saturation, %	91 (86 to 94)	96 (94 to 97)	90 (88 to 93)	.05
Initial PEF, L/min	148 (110 to 170)	137 (75 to 200)	110 (69 to 150)	.68
Initial FEV ₁ , L	0.74 (0.46 to 1.08)	0.75 (0.61 to 1.20)	1.48 (0.53 to 1.51)	.31
Initial SVC, L	1.46 (1.05 to 2.02)	1.01 (0.87 to 1.97)	1.78 (1.41 to 2.00)	.47
Final PEF, L/min	153 (78 to 200)	115 (94 to 300)	239 (195 to 294)	.20
Final FEV ₁ , L	0.77 (0.52 to 1.11)	0.79 (0.63 to 1.01)	1.59 (1.41 to 1.89)	.06
Final SVC, L	1.54 (1.05 to 2.06)	1.30 (0.80 to 1.91)	2.09 (1.07 to 2.13)	.69
ΔPEF, L/min	12 (−0.6 to 31)	27 (2 to 70)	98 (98 to 98)	.40
ΔFEV ₁ , L	0.02 (−0.04 to 0.17)	0.02 (−0.03 to 0.19)	0.01 (−0.07 to 0.08)	.80
ΔSVC, L	−0.01 (−0.16 to 0.30)	−0.01 (−0.07 to 0.32)	0.11 (−0.17 to 0.12)	.78
ED disposition				.06
Treated and released	9 (15)	6 (50)	2 (33)	
Admitted	44 (73)	6 (59)	4 (67)	
Admitted to ICU	7 (12)	0 (0)	0 (0)	

PEF indicates peak expiratory flow; ICU, intensive care unit.

^aData are presented as n (%) or median (IQR).

Table 3Validation of COPD among the 18 patients who denied self-reported COPD diagnosis^a

Characteristic	Clinically validated COPD ^b (n = 15)	<i>P</i> value	Spirometrically validated COPD ^b (n = 10)	<i>P</i> value
Female	12 (100)	.03	8 (80)	.58
Male	3 (50)		2 (67)	
Age >65 y	12 (80)	.17	7 (70)	.71
Race		.20		.36
White	9 (60)		6 (60)	
Black	2 (13)		2 (20)	
Hispanic	2 (13)		2 (20)	
Other	2 (13)		0 (0)	
Education		.35		1.0
8th grade	5 (33)		3 (30)	
Some high school	4 (27)		3 (30)	
High school graduate	4 (27)		2 (20)	
Any college	2 (13)		2 (20)	
Spirometry				
Initial PEF, L/min	130 (70 to 160)	.19	130 (69 to 160)	.38
Initial FEV ₁ , L	0.79 (0.61 to 1.37)	.17	0.7 (0.61 to 1.2)	.64
Initial SVC, L	1.09 (0.87 to 1.97)	.14	0.91 (0.66 to 1.58)	.21
Final PEF, L/min	146 (100 to 248)	.48	115 (100 to 146)	.65
Final FEV ₁ , L	0.79 (0.63 to 1.01)	.02	0.64 (0.59 to 0.81)	.05
Final SVC, L	1.3 (0.80 to 1.88)	.31	1.16 (0.68 to 1.51)	.68
ΔPEF, L/min	27 (2 to 98)	.62	2 (−15 to 40)	.25
ΔFEV ₁ , L	0.03 (−0.03 to 0.19)	.03	0.02 (−0.03 to 0.03)	.88
ΔSVC, L	0.08 (−0.07 to 0.32)	.50	−0.02 (−0.27 to 0.32)	.80

PEF indicates peak expiratory flow.

^aData are presented as n (%) or median (IQR).^bSee "Methods" section for definition of "clinically validated" and "spirometrically validated" COPD.