

# Attitudes Toward the Diagnosis of Chronic Obstructive Pulmonary Disease in Primary Care

M. Miravittles,<sup>a</sup> C. de la Roza,<sup>a</sup> K. Naberan,<sup>b</sup> M. Lamban,<sup>c</sup> E. Gobartt,<sup>d</sup> A. Martín,<sup>e</sup> and K.R. Chapman<sup>f</sup>

<sup>a</sup>Servicio de Neumología, Institut Clínic del Tòrax, IDIBAPS, Hospital Clínic, Barcelona, Spain.

<sup>b</sup>Grupo de Neumología de la Sociedad Catalana de Medicina de Familia, Spain.

<sup>c</sup>Centro de Salud Rebolera, Zaragoza, Spain.

<sup>d</sup>Departamento Médico, Boehringer Ingelheim, Spain.

<sup>e</sup>Departamento Médico, Pfizer, Spain.

<sup>f</sup>Division of Respiratory Medicine, Department of Medicine, University of Toronto, Toronto, Ontario, Canada.

**OBJECTIVE:** Although the prevalence of chronic obstructive pulmonary disease (COPD) has increased among women, it is still considered a disease that mainly affects men. This study aimed to identify the diagnostic attitudes of primary care physicians toward patients with COPD according to gender and spirometric results.

**METHOD:** A representative sample of 839 primary care physicians participated in the study. Each physician dealt with 1 of 8 hypothetical cases based on a patient diagnosed with COPD. In half the cases, the physician was told the patient was a man. The other half of the physicians were told the same patient was a woman. After presentation of the medical history and results of physical examination, the physicians were asked to state a probable diagnosis and indicate the diagnostic tests that were necessary. They were then told the results of spirometry, which indicated obstruction ranging from moderate to severe. Negative results of bronchodilator tests and oral corticosteroid tests were then communicated.

**RESULTS:** COPD was more likely to be the preliminary diagnosis for male patients than for females (odds ratio [OR], 1.55; 95% confidence interval [CI], 1.15-2.1). This gender bias disappeared once the physicians were shown the abnormal results of spirometry. Patients with severe obstruction were more likely to be diagnosed with COPD than those with moderate obstruction (OR, 1.5; 95% CI, 1.08-2.09).

**CONCLUSIONS:** There is gender bias in the diagnosis of COPD. Patients with moderate obstruction are often believed not to have COPD. These biases may compromise the early diagnosis of the disease in a group of patients with ever increasing risk.

**Key words:** COPD. Diagnosis. Sex. Primary care. Spirometry.

Problemas con el diagnóstico de la EPOC en atención primaria

**OBJETIVO:** La prevalencia de la enfermedad pulmonar obstructiva crónica (EPOC) ha aumentado en el sexo femenino, pero aún se considera una enfermedad que afecta sobre todo a los varones. Este estudio pretendió identificar las actitudes diagnósticas de los médicos de atención primaria frente a pacientes con EPOC según su sexo y los resultados de la espirometría.

**MÉTODO:** Participó en el estudio una muestra representativa de 839 médicos de atención primaria. Cada uno de ellos resolvió uno entre 8 casos posibles de pacientes con EPOC. La mitad de éstos correspondía a un paciente varón y la otra mitad a una mujer con historia clínica y exploración física idénticas. Tras la historia y la exploración física se solicitó a los participantes un diagnóstico provisional, así como las pruebas diagnósticas necesarias. Se facilitaron después los resultados de la espirometría que mostraban una obstrucción de carácter moderado o grave. Los resultados negativos de una prueba broncodilatadora y de una prueba con corticoides orales se dieron a continuación.

**RESULTADOS:** La EPOC fue un diagnóstico provisional más probable para los pacientes varones que para las mujeres (odds ratio [OR]: 1,55; intervalo de confianza [IC] del 95%, 1,15-2,1). Este sesgo desaparecía después de mostrar los resultados anormales de la espirometría. Los pacientes con una obstrucción de carácter grave eran diagnosticados con mayor probabilidad de EPOC que aquellos con una obstrucción moderada OR: 1,5; IC del 95%, 1,08-2,09).

**CONCLUSIONES:** Existe un sesgo diagnóstico en función del sexo del paciente. En muchas ocasiones no se diagnostica a los pacientes con EPOC que presentan una obstrucción moderada. Estos sesgos podrían comprometer el diagnóstico precoz de la EPOC en un grupo cada vez más frecuente de individuos en riesgo.

**Palabras clave:** EPOC. Diagnóstico. Sexo. Atención primaria. Espirometría.

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Correspondence: Dr. M. Miravittles.  
Servicio de Neumología, Hospital Clínic, Villarroel, 170.  
08036 Barcelona, España.  
E-mail: marem@clinic.ub.es

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## Introduction

Chronic obstructive pulmonary disease (COPD) is a common cause of illness and death in developed countries. In spite of antismoking campaigns, the prevalence and mortality rates of COPD continue to rise

every year. Between 1979 and 1993, the age-adjusted mortality rate for COPD in the United States of America increased 47.3%<sup>1</sup> and it continues to rise.

COPD represents a great economic burden for society: in Spain the average direct cost per patient ranges from €910 to €2061, depending on residence,<sup>2,4</sup> and in the USA the figure exceeds \$10 812 per patient with severe disease.<sup>5</sup> One economic study demonstrated that the best approach to reducing costs arising from COPD is to diagnose it early and to manage it well in the early stages.<sup>6</sup> However, several studies have shown that most COPD patients remain undiagnosed even at advanced stages<sup>7-9</sup> and that underdiagnosis is the reason why such measures as vigorous antismoking counseling with appropriate treatment and monitoring are not provided. The problem of underdiagnosis is particularly important in women because COPD has been perceived as a disease that affects mainly men. In the USA and Canada general practitioners have also been found to be less likely to consider a diagnosis of COPD for women.<sup>10</sup>

In Spain the prevalence of COPD is lower in women than in men overall<sup>7</sup> but is similar in both sexes between the ages of 20 and 40 years.<sup>11</sup> For that reason, and also because of the greater susceptibility of women to the adverse effects of tobacco smoke, an increase in COPD prevalence among women is predicted.<sup>12</sup> It is therefore important to examine how primary care physicians approach diagnosis in terms of their clinical assumptions for men and women. With the results, we will be able to identify deficiencies in our understanding and develop training strategies directed to improving early diagnosis.

We present the results of a study of a large, representative sample of Spanish primary care physicians. The aim was to identify their diagnostic attitudes toward hypothetical cases of male and female patients with COPD, presented with identical chronic respiratory symptoms and exposure to tobacco smoke. We also investigated the influence of the results of lung function tests on the diagnosis made in these cases.

## Method

### *Study Design*

The objective was to study the influence of gender, spirometry results, and oral corticosteroid test results on the diagnostic attitude of primary care physicians with respect to COPD. Doctors were randomly invited to participate from lists for all Spanish autonomous communities kept by the companies that funded the study. If a doctor refused to participate, another doctor was chosen at random and invited. The participants responded to questions about a hypothetical case to be reviewed and diagnosed. The sessions took place between November 2003 and April 2004.

With the permission of the authors of the similar US and Canadian study,<sup>10</sup> the cases were translated to Spanish. The applicability, clarity, and consistency of the original instrument and the clarity and consistency of the Spanish version were tested in a sample of 20 primary care physicians and specialists in pneumology.

The cases were described in detail in a previous article.<sup>10</sup> Briefly, the patient was 55 years old and a smoker of approximately 40 pack-years. For 4 years, he or she had had a persistent chronic cough that worsened with respiratory infections. The diagnostic process involved 4 steps with permutations that gave rise to 8 hypothetical cases, as shown in Figure 1. Cases were distributed among the participants: case number 3 was reviewed by the smallest number of physicians (43) and case number 2 by the largest number (123).

In the first step, half the physicians were told that the patient was a woman and the other half were told he was a man. They were asked to state the most likely diagnosis and what diagnostic tests should be ordered. Regardless of the preliminary diagnosis stated or tests ordered, the doctors were then shown the hypothetical patient's normal blood test results and a normal electrocardiogram and chest x-ray. Then, abnormal spirometric results were revealed. Next, the spirometric results—forced vital capacity (FVC), forced expiratory volume in the first second (FEV<sub>1</sub>), and the ratio FEV<sub>1</sub>/FVC—were given for 1 of 2 hypothetical patients, but with no interpretation of the results. The values were indicative of obstruction that was either moderate (FEV<sub>1</sub>, 52% of predicted and FEV<sub>1</sub>/FVC of 43%) or severe (FEV<sub>1</sub>, 32% of predicted and FEV<sub>1</sub>/FVC of 27%). The physician then stated the most likely diagnosis. In the third step, the doctors were given the results of spirometry, half of which were scarcely changed after administration of a bronchodilator, and once again a diagnosis was asked for. Finally, in the fourth step the investigators revealed the negative results of a trial with oral corticosteroids (40 mg of prednisone per day for 2 weeks), after which no significant changes in FEV<sub>1</sub> were observed. For the last time, the doctor was asked to state the suspected diagnosis.

### *Statistical Analysis*

After evaluating all answers given, we recorded a diagnosis of COPD if that was the only diagnosis stated or if COPD was paired with any other diagnosis except asthma.

The  $\chi^2$  test was used to compare the frequency of COPD diagnosis for each of the different variables at the different steps of the process (step 1, sex; step 2, spirometric results; step 3, bronchodilator test; and step 4, oral corticosteroid trial). Logistic regression analysis was performed with COPD diagnosis as the dependent variable. Of the 4 independent variables (sex, severity of airflow obstruction, results of a bronchodilator response test, and results of a trial with oral corticosteroids), the last 2 did not enter into the model because they did not show a statistically significant correlation with COPD diagnosis in the univariate analysis. A model was constructed for the first step, with sex as the independent variable. A second model was constructed for the second step of the process, with sex and severity of obstruction as the independent variables. Significance was set at a value of *P* less than .05.

## Results

A total of 839 primary care physicians working in outpatient clinics in 17 Spanish autonomous communities participated. Distribution was proportional to the number of doctors in each community.

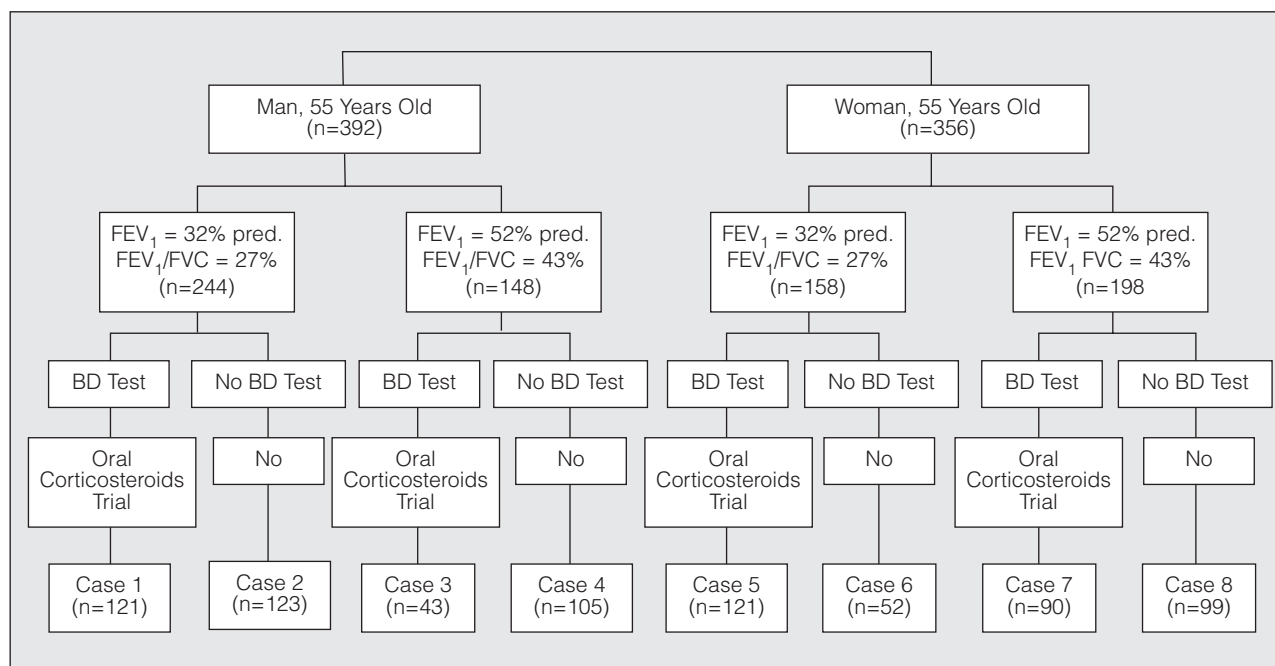


Figure 1. Distribution of information in cases used in the study. FEV<sub>1</sub> indicates forced expiratory volume in the first second; FVC, forced vital capacity; BD, bronchodilator.

The most frequent diagnosis after presentation of information from the medical history and physical examination was asthma and COPD in combination (18.9%). COPD was mentioned by 14.5%, a percentage that increased significantly to 66.4% ( $P < .001$ ) after spirometric results were revealed. However, the frequency of COPD diagnosis did not increase significantly after results from the trial of oral corticosteroids were shown (Table 1). When we considered that a diagnosis of COPD was recorded in all cases in which COPD was named in combination with any other diagnosis except asthma, the percentage for COPD was 36.8% after the first step, 74% after spirometry ( $P < .001$ ), and 72.8% after the results of the oral corticosteroid trial.

The doctors were more likely to suggest COPD as the first or provisional diagnosis when the hypothetical patient was a man (41.6% vs 31.4% when the patient was a woman;  $P = .015$ ) (Figure 2). Diagnostic differences for men and women disappeared after abnormal spirometric results were revealed (74% gave the male patient a diagnosis of COPD and 74.1% gave that diagnosis for the female;  $P = .98$ ). No difference between the frequency of COPD diagnosis for men and women was seen after the oral corticosteroid test results (Figure 2, Table 2).

Asthma was the second most common diagnosis: 9.5% gave asthma as the diagnosis after the initial presentation, 8.1% after spirometry, and 2.2% after the oral corticosteroid trial. Differences related to patient gender were found for a diagnosis of asthma only after the initial presentation of the medical history and findings of physical examination (Table 3).

Severity of airflow obstruction was significantly associated with a greater likelihood of a diagnosis of COPD, such that those with severe limitation were diagnosed with COPD by 77.6% of the subjects whereas those with moderate limitation were so diagnosed by 69.7% ( $P = .043$ ). The negative results of the bronchodilator and oral corticosteroid tests did not increase the likelihood of a diagnosis of COPD (Figure 3).

Logistic regression analysis showed that after presentation of the case history and physical examination findings, the odds ratio (OR) for a COPD

TABLE 1  
Most Frequent Diagnoses for the 8 Cases After Each Step in the Process\*

After step 1: history and physical examination (n=739)	
Asthma and COPD	140 (18.9%)
COPD and chronic bronchitis	130 (17.6%)
COPD	107 (14.5%)
Asthma, COPD, and chronic bronchitis	72 (9.7%)
Other	290 (39.3%)
After steps 2 and 3: spirometry (n=739)	
COPD†	491 (66.4%)
Chronic bronchitis	73 (9.9%)
Asthma	58 (7.8%)
COPD and chronic bronchitis	41 (5.5%)
Other	76 (10.4%)
After step 4: trial of oral corticosteroids (n=360)	
COPD‡	244 (67.8%)
Chronic bronchitis	37 (10.3%)
Emphysema	34 (9.4%)
COPD and chronic bronchitis	10 (2.8%)
Other	35 (9.7%)

\*COPD indicates chronic obstructive pulmonary disease.

†Significant increase in the diagnosis of COPD ( $P < .001$ ).

‡Non-significant increase in COPD diagnosis between steps 2 and 3 ( $P = .78$ ).

TABLE 2  
Diagnoses at Each Step in the Diagnostic Process

	Medical History and Physical Examination		Spirometry		Oral Corticosteroids Trial	
	Man	Woman	Man	Woman	Man	Woman
COPD, chronic bronchitis, and/or emphysema	163 (41.6%)	109 (31.4%)	290 (74%)	257 (74.1%)	120 (73.2%)	142 (72.4%)
Asthma	33 (8.4%)	37 (10.7%)	32 (8.2%)	28 (8.1%)	4 (2.4%)	4 (2.1%)
Other	196 (50%)	201 (57.9%)	70 (17.8%)	62 (17.8%)	40 (24.4%)	50 (25.5%)

diagnosis was 1.55 for men in comparison with women (95% confidence interval [CI], 1.15-2.1;  $P = .004$ ). After presenting the results of spirometry the differences between men and women disappeared. The OR for a diagnosis of COPD was 1.5 (95% CI, 1.08-2.09;  $P = .015$ ) in the presence of severe airflow obstruction rather than moderate obstruction.

The sample size did not provide enough statistical power to allow comparison of results between the autonomous communities.

The participating doctors ordered a mean (SD) of 3.1 (1.1) diagnostic tests per patient, and there were no significant differences by gender (3.2 [1.2] for men vs 3 [1.1] for women;  $P = .72$ ). The test ordered most often

was spirometry, followed by chest radiography. Spirometry and skin tests were ordered more often for women, whereas electrocardiograms and blood tests were ordered more often for men (Table 3).

### Discussion

This study reveals that primary care physicians rarely suspect COPD when there is a medical history of smoking and chronic respiratory symptoms in a middle aged smoker and that suspicion is less prevalent when the patient is female. Diagnostic prejudice in the form of gender bias disappears when abnormal spirometric results are known. We also observed that a significantly greater percentage of physicians gave a diagnosis of COPD when abnormal spirometric findings were severe rather than moderate. Neither a negative bronchodilator test or a negative oral corticosteroid trial improved the likelihood of a diagnosis of COPD.

These results are similar in part to those of the study of 192 primary care physicians performed in the USA and Canada 5 years ago.<sup>10</sup> In that study 57% of the

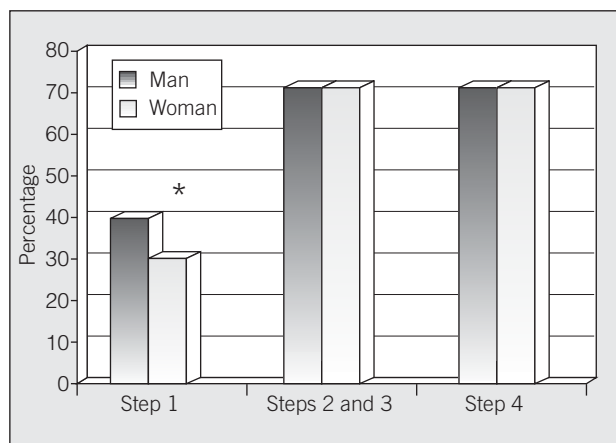


Figure 2. Influence of gender on the diagnosis of chronic obstructive pulmonary disease (COPD) before and after diagnostic test results were revealed. Step 1, diagnosis of COPD after presentation of the case; steps 2 and 3, after results of spirometry and bronchodilator tests; step 4, after results of the oral corticosteroids trial. \* $P = .004$ .

TABLE 3  
Diagnostic Tests Ordered After Initial Case Presentation, by Gender

Diagnostic Test	All	Man	Woman
Spirometry*	724 (97.9%)	380 (96.9%)	344 (99.1%)
Chest x-ray	643 (87%)	346 (88.2%)	297 (85.6%)
Electrocardiogram*	350 (47.3%)	200 (51%)	150 (43.2%)
Blood tests†	338 (45.7%)	198 (50.5%)	140 (40.3%)
Skin tests*	202 (27.3%)	95 (24.2%)	107 (30.8%)
Sputum culture	42 (5.7%)	24 (6.1%)	18 (5.1%)

\* $P < .05$  between men and woman.  
† $P < .01$  between men and woman.

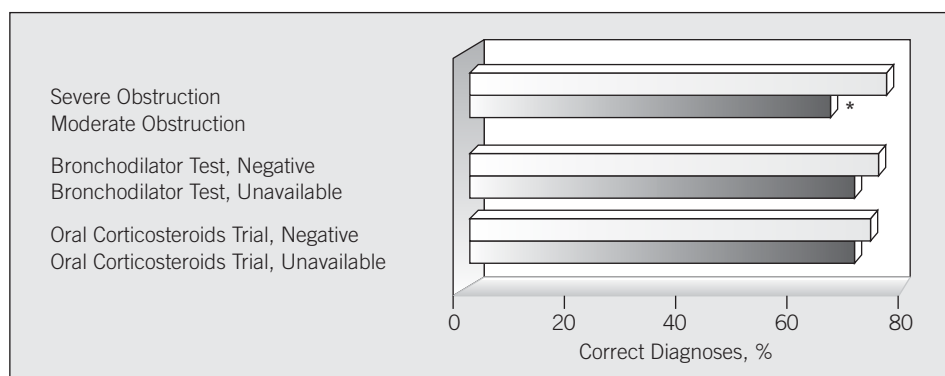


Figure 3. Influence of the results of diagnostic test results on the diagnosis of chronic obstructive pulmonary disease. \* $P = .018$ .

participants considered a diagnosis of COPD after the medical history and physical examination, whereas in our study only 36.8% did. The studies were similar with regard to bias related to gender—in our study male patients were 1.55 times more likely to receive a diagnosis of COPD than females were. COPD has traditionally been considered a disease found in men in Spain. Until the 1970s women did not smoke in large numbers and the prevalence of COPD in women has remained low until recently. The IBERPOC study found that in 1998 the prevalence of COPD was 14.3% in men between 40 and 70 years old, but only 2.9% in women.<sup>7</sup> The prevalence in women is expected to increase given that 40% of women between 20 and 40 years old are now smokers.<sup>11</sup> Other European countries expect similar changes in the epidemiology of COPD; for example, the prevalence of the disease in men in the United Kingdom seems to have peaked but the figures for women are still rising.<sup>13</sup> This change will require primary care physicians to change the way they approach diagnosis, so that COPD is considered regardless of whether the patient is male or female. In fact, only age and accumulated smoking, not sex, are significant risk factors for COPD in smokers identified in primary care.<sup>14</sup> For this reason, campaigns are needed to eradicate the perception of women being less likely to develop COPD than men and also to assure that spirometry is ordered in smokers and ex-smokers with respiratory symptoms regardless of sex.

The high frequency (98%) with which doctors ordered spirometry after initial presentation was surprising. This is in sharp contrast with the findings of the North American study in which spirometry was requested initially by only 22%,<sup>10</sup> and with another study in Spain in which only 36.4% of primary care physicians ordered that test for patients suspected of COPD.<sup>15</sup> The large number of spirometric tests ordered may reflect an increased interest in COPD among primary care physicians and their familiarity with recently published and publicized guidelines, although we can not rule out the possibility that it is a positive bias given that the doctors knew they were going to participate in a survey related to COPD. Our results should be interpreted in the light of usual clinical practice, particularly because studies in large populations in Spain indicate that spirometric findings are available for fewer than 50% of patients with a preliminary diagnosis of COPD.<sup>16,17</sup>

Some previous studies have demonstrated a high diagnostic yield for COPD screening programs that employ spirometry in primary care.<sup>18-23</sup> However, it is also important to consider how spirometric results are interpreted, given that we have observed that a significantly greater proportion of the patients received a diagnosis of COPD when obstruction was severe than when it was moderate, in spite of negative bronchodilator and oral corticosteroid test findings. The efficiency of COPD screening programs may be compromised if primary care doctors do not recognize

patients in initial stages of airflow obstruction. In effect, the IBERPOC study demonstrated that COPD severity measured by FEV<sub>1</sub> was significantly and independently associated with the probability of having been diagnosed with COPD before enrollment in the study.<sup>24</sup> This finding confirms the scarce importance placed on slight or moderate obstruction as a marker of altered airway health.<sup>25</sup> Surprisingly, this problem is also present in the hospital setting. A recently published study found that only 30% to 33% of patients admitted to a general hospital with mild or moderate airflow obstruction were discharged with a diagnosis of obstructive lung disease and only 40% of those patients with any degree of obstruction as indicated by spirometry were prescribed bronchodilator treatment when discharged.<sup>26</sup>

The bronchodilator and oral corticosteroid tests failed to influence the physicians' diagnostic attitude with regard to COPD, but there was a negative effect of the oral corticosteroid trial in the sense that it decreased the likelihood of a diagnosis of asthma. It is possible that the participants were unfamiliar with how to interpret those tests and in fact when the subjects were asked what tests they would order after the initial presentation of a case, neither test was mentioned.

In summary, this study confirms that men are more likely than women to be diagnosed with COPD, even when their medical histories, smoking habits, and physical examination findings are identical. A significant increase in the number of spirometric tests ordered was also observed in comparison with earlier studies. This may reflect the impact of educational campaigns and the promotion of published guidelines.<sup>27</sup> However, many primary care physicians do not recognize COPD when spirometric findings indicate moderate obstruction. In future educational programs for physicians, it will be essential to emphasize the rising incidence of COPD in women and the importance of early detection.

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