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Original Research

Veterans Airflow Obstruction Screening Questionnaire: A Survey to Identify Veterans with Airflow Obstruction

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Abstract

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality within the Veterans Healthcare Administration (VHA) and is frequently under-diagnosed. We developed the Veterans Airflow Screening Questionnaire (VAFOSQ) to improve the identification of Veterans with airflow obstruction (AFO), the most commonly used criterion for the diagnosis of COPD. We created an initial survey with 78 variables that have been associated with AFO. A total of 825 patients in 3 primary care clinics performed spirometry after bronchodilator administration and completed the initial survey. Best sets regression was used to build a model that predicted AFO optimally. A total of 195 of 825 (23.3%) patients had AFO and 7 items positively predicted AFO. When the questionnaire score was greater than 25, the VAFOSQ accurately identified AFO with an area under the receiver operating curve of 0.72. In a prospective validation cohort of 376 participants, the positive predictive value was 32% and negative predictive value 81%. The VAFOSQ is a reliable and valid instrument for the identification of veterans at risk for AFO who would benefit from further evaluation with spirometry and assessment for COPD. The VAFOSQ is straightforward to use and can be easily self-administered and self-scored enabling widespread application within the VHA.

Abbreviations: chronic obstructive pulmonary disease, **COPD**; Veterans Healthcare Administration, **VHA**; Veterans Airflow Screening Questionnaire, **VAFOSQ**; airflow obstruction, **AFO**; forced expiratory volume in 1 second, **FEV_1**; forced vital capacity, **FVC**; lower limit of normal, **LLN**; Third National Health and Nutrition Examination Survey, **NHANES III**; Veterans Administration Medical Center, **VAMC**; American Thoracic Society, **ATS**; receiver operating characteristics, **ROC**

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Introduction

Chronic obstructive pulmonary disease (COPD) is an important cause of morbidity and mortality both in the United States and worldwide.[1-3] COPD is an under-recognized condition and diagnosis frequently does not occur until lung function is significantly diminished.[4] Increasing evidence suggests that early detection and intervention are the best methods of reducing the burden of COPD and improving the quality of life of patients with COPD.[5-8] Spirometry is the best method to diagnose airflow obstruction (AFO) and a forced expiratory volume in 1 second (FEV_1) to forced vital capacity (FVC) ratio less than either 0.7 or the lower limit of normal (LLN) are the usual thresholds for the presence of AFO.

The Third National Health and Nutrition Examination Survey (NHANES III) estimated the prevalence of COPD at 6.8% to 8.5% within the general U.S. population and a more recent Centers for Disease Control and Prevention questionnaire-based survey reported 6.3% of the population had been diagnosed with COPD.[9,10] Among veterans hospitalized in the VHA from 1997 to 2001, COPD was the fourth most common discharge diagnosis; approximately one third of all VHA patients and one sixth of all VHA inpatients had a diagnosis of COPD.[11] The prevalence of COPD in the VHA population is 33%–43% and COPD is also under-diagnosed in this population.[12]

Recently, COPD diagnosis has been improved by the development of reliable screening questionnaires that identify individuals likely to have AFO and who are candidates for further evaluation with spirometry and assessment for COPD.[13] These questionnaires have, however, been developed and validated in samples of the general population or among those with pulmonary disorders.[14-16] The VHA patient population is significantly different from the general population – it is mostly male and older with a higher prevalence of both ever smoking and AFO.[12,17] Screening questionnaires designed and validated in the general population tend to be less accurate in the VHA population and there is a need for a VHA-specific COPD screening questionnaire to identify patients who would benefit from further evaluation with spirometry. Further, all questionnaires to date have used a fixed ratio threshold (FEV_1/FVC<0.7) for the diagnosis of AFO rather than LLN (FEV_1/FVC<LLN).

As part of a VHA quality improvement project aimed at developing a patient-centered model for the management of COPD, we developed an AFO screening instrument to identify veterans with an increased risk for AFO and who might benefit from spirometry and assessment for COPD.

Materials and Methods

Questionnaire Construction

Initial questionnaire development began with a synthesis of the literature reviewing common symptoms and historical factors in patients with AFO and COPD. These variables were organized into 5 conceptual domains: (1)functional impairment, (2) phlegm production, (3)history of upper respiratory tract infections, (4)history of chest congestion, cough and wheezing, and (5)smoking exposure and history. Starting with the 5 domains, our working group (2 pulmonologists and an internist) developed questions based upon the presence, frequency, duration, and quality of COPD symptoms. The initial questionnaire also included a review of patient-identified, previously diagnosed medical conditions, and the respondent's age and sex. The initial questionnaire included 78 Likert style questions and was tested in the Cincinnati Veterans Administration Medical Center (VAMC) pulmonary clinic to ensure that patients could easily understand the questions; any ambiguous questions were revised and retested. The 78 item initial questionnaire is included in the online supplement, Appendix A.

Data Collection

Three licensed practical nurses and an internist underwent spirometry training and performed all spirometry testing. For approximately 6 months, all patients at 3 Cincinnati VAMC primary care clinics with a previously scheduled office visit were asked to participate in the study. A total of 887 patients completed the 78 item questionnaire; spirometry was performed before and 10 minutes after albuterol administration via a metered-dose inhaler and a spacer according to American Thoracic Society (ATS) standards.[18] AFO was defined as post-bronchodilator FEV_1/FVC<LLN calculated from the NHANES III data.[19] We selected the LLN as the threshold for the definition of AFO because it controls for age-related changes in the FEV_1/FVC which are not accounted for by the 0.7 fixed ratio threshold.[20,21] Spirometry tracings were reviewed by a pulmonologist to ensure adherence with ATS

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standards.[18] Only patients with spirometry tracings meeting ATS criteria were included in the analysis.

Statistical Analysis

We divided the complete sample (N=887) into a model building subset (n=600) and a retrospective validation subset (n=287). Using best-subsets regression, we identified the 10 best fitting combinations of predictors (from the initial set of 78 questions) for model sizes of 5 to 10 variables (an instrument with >10 questions was considered too lengthy). We then assessed which variables consistently appeared in the best fitting models (i.e., the proportion of times each variable appeared in the top models). This process identified 7 questions that showed the most robust association with AFO and we verified that combinations of these variables formed one of the best 7-variable models (this step was necessary to ensure that highly collinear variables with strong univariate associations with the outcome were not used together but rather that each variable contributed independent predictive power). To create a simple scoring algorithm based on summing Likert-type scores (ranging from 0 to 3), we iteratively tested various weightings of these variables to find a scoring that retained as much of the predictive power of the original regression equation as possible. The resulting screening instrument was scored prospectively in the validation sample to give an unbiased independent estimate of its predictive power in future applications in similar VHA populations.

Prospective Validation Testing

The 7 item Veterans AFO Screening Questionnaire (VAFOSQ) was validated prospectively in 3 VHA primary care clinics. For a period of approximately 3 months, all patients with a previously scheduled office visit were recruited for study participation and 380 patients completed the questionnaire. Spirometry was performed before and 10 minutes after albuterol administration via a metered-dose inhaler and a spacer according to ATS standards.[18]

Test-Retest Study

A subset of participants in the validation cohort were given the VAFOSQ and a stamped self-addressed envelope (n=45). They were asked to complete the VAFOSQ 2 weeks after participation in the validation study and return the questionnaire by mail for test-retest reliability analysis. A total of 18 patients returned the questionnaires.

Results

Demographics and Spirometry

A total of 887 patients completed the initial 78 item questionnaire; 62 (7.0%) were not included in the analysis due to incomplete questionnaires (n=35) or for incomplete spirometry or spirometry that did not meet ATS standards (n=27). Of the 825 participants included in the analysis, the mean age was 62.9 years (SD 11.1, range 21-93) and 195 (23.6%) had AFO based upon $FEV_1/FVC<LLN$. A majority, 776 (94.1%), were male. A total of 76 patients (9.2%) had self-reported emphysema and 86 (10.4%) had self-reported chronic bronchitis. Patients with AFO were likely to be older with a history of smoking. Table 1 presents participants' demographic and clinical characteristics.

Spirometry data are presented in Table 2. A total of 630 patients (76.4%) had no AFO; 20 (2.4%) had mild AFO, 120 (14.5%) had moderate AFO, 42 (5.1%) had severe AFO, and 13 (1.6%) had very severe AFO based upon FEV_1 %predicted.[20] Bronchodilator responsiveness (≥12% increase over baseline and ≥200ml) was present in 38 (19.5%) patients with AFO. In patients without AFO, bronchodilator responsiveness occurred in 11 (1.7%).

Initial Scoring

Item level missing data were mostly less than 4% except for a few items listed in Table 3. Overall missing items accounted for 1.3% of the initial 78 item questionnaire.

Table 4 shows the results of applying the final AFO screening questionnaire to the original dataset. The average score was 25.4 for patients with AFO and 20.9 for those without AFO. The mean VAFOSQ score increased as the severity of AFO worsened (Table 4). The score was 22.3 in patients with mild COPD, 25.1 in patients with moderate COPD, 26.3 in patients with severe COPD and 30.0 in patients with very severe COPD. Figure 1 shows the final screening questionnaire; within each response box is a shaded number that is the weighted score of that response.

Receiver operating characteristics (ROC) analysis was conducted to evaluate the VAFOSQ score in screening for AFO.[22] Table 5 shows the changes in sensitivity, specificity, positive predictive value, negative predictive value, and odds ratio of different total score thresholds. Lower cut-offs are associated with a higher sensitivity

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Table 1. Patient Demographics

	Airways Obstruction (FEV_1/FVC < LLN)	%	No Airways Obstruction (FEV_1/FVC > LLN)	%
n	195	23.6%	630	76.4%
Age mean+SD (range)	64.8+10.6 (27-93)	-	62.3+11.2 (21-92)	-
Male	186	22.50%	590	71.50%
Self-reported Chronic Conditions				
COPD	89	10.80%	74	9.00%
Asthma	49	5.90%	87	10.50%
Emphysema	48	5.80%	28	3.40%
Chronic Bronchitis	33	4.00%	53	6.40%
Lung Cancer	5	0.60%	3	0.40%
Sleep Apnea	21	2.50%	129	15.60%
Heart Attack	26	3.20%	79	9.60%
Stroke	13	1.60%	51	6.20%
Heart Failure	6	0.70%	28	3.40%
Anemia	3	0.40%	35	4.20%
Pulmonary Embolism	3	0.40%	3	0.40%
DVT	12	1.50%	25	3.00%
Hypertension	115	13.90%	391	47.40%
Osteoporosis	5	0.60%	18	2.20%
Depression	60	7.30%	193	23.40%
Anxiety	37	4.50%	146	17.70%
Weight Loss	15	1.80%	47	5.70%
Smoking History				
Never Smoked	5	1.00%	101	12.20%
Former Smoker	84	10.20%	308	37.30%
Current Smoker	106	12.80%	221	26.80%
Passive Smoke Exposure				
Mother Smoked	99	12.00%	281	34.10%
Father Smoked	152	18.40%	446	54.10%
Partner Smoked	160	19.40%	461	55.90%
Prescribed Inhaler	144	17.50%	238	28.80%

Percentages are the proportion of the entire study population n= 825. FEV_1: forced expiratory volume in 1 second; FVC: forced vital capacity; LLN: lower limit of normal; COPD: chronic obstructive pulmonary disease; SD: standard deviation; DVT: deep venous thrombosis

and lower specificity while higher scores provide a lower sensitivity and higher specificity. A total score threshold of 25 provided an optimal balance between sensitivity and specificity as well as high correct classification rates for AFO. Figure 2 shows the ROC curve and, at the selected threshold of 25, VAFOSQ sensitivity was 59.9% and specificity was 69.8% with an area under the curve of 0.72.

Prospective Validation and Test-Retest Reliability

Of the 383 participants in the validation study, 376 completed acceptable spirometry testing. Based

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Table 2. Spirometry

Spirometry	All		+AFO		-AFO	
	Pre-BD	Post-BD	Pre-BD	Post-BD	Pre-BD	Post-BD
FEV_1 mean+SD (range) liters	2.53+0.84 (0.34-4.75)	2.63+0.82 (0.50-4.83)	1.7+0.7 (0.34-4.29)	1.9+0.7 (0.50-4.48)	2.8+0.7 (0.78-4.75)	2.9+0.7 (0.84-4.83)
FEV_1 % Predicted mean+SD (range)	77.89+22.85 (11-175)	81.51+21.93 (17-168)	55.0+18.4 (11.7-100)	59.46+17.63 (17-104)	85.7+18.9 (30.2-174.9)	88.3+18.2 (38-169)
FVC mean+SD (range) liters	3.55+0.91 (0.99-6.78)	3.63+0.88 (1.23-6.76)	3.2+0.9 (0.99-6.78)	3.4+0.9 (1.39-6.76)	3.7+0.9 (1.23-6.34)	3.7+0.9 (1.23-6.33)
FVC % Predicted mean+SD (range)	82.82+17.90 (26-148)	85.25+16.95 (30-142)	75.0+18.1 (26-116)	80.95+16.92 (30-116)	85.2+17.1 (32-148)	86.6+16.7 (36-142)
FEV_1/FVC mean+SD (range)	0.70+0.12 (.24-.92)	0.72+0.12 (0.26-0.93)	0.53+.10 (0.24-0.84)	0.54+0.10 (0.26-0.87)	0.76+0.07 (0.51-0.92)	0.77+0.07 (0.6-0.93)

AFO: airflow obstruction; BD: bronchodilator; FEV_1: forced expiratory volume in 1 second; FVC: forced vital capacity; SD: standard deviation

Table 3. Survey Items With the Highest Missing Response Rates

Questionnaire Item	Missing Response Rate
How often do your symptoms worsen?	4.1%
Years lived with smoker	4.2%
Packs smoked per day	5.2%
How many years have you been coughing?	6.0%
How many years have you had phlegm?	6.8%
How old where you when you started wheezing?	7.2%
How many years have you been wheezing?	8.6%

upon a LLN threshold, 102 (27.1%) had AFO and 274 (72.2%) did not. The mean post-bronchodilator FEV_1 was 2.69+0.87 liters and the mean FVC was 3.81+1.03 liters. A total of 338 (89.9%) patients had smoked more than 100 cigarettes in their lifetime and 97 (25.8%) had a prior history of COPD. In this prospective validation cohort, the sensitivity of the VAFOSQ for AFO was 72% and the specificity was 44%. The positive predictive value was 32% and the negative predictive value was 81%.

A subset of the validation cohort completed the screening questionnaire, repeated it 2 weeks later, and returned the second response by mail. The average initial score was 26.5 and the average re-test score was 26.9. The overall correlation coefficient was 0.6.

Discussion

We developed a brief, easy to complete AFO screening survey based upon patient reported information and validated the questionnaire in VHA primary care clinics. The survey was designed for ease of administration and can be completed by patients across a range of literary skills. The final VAFOSQ can be self-administered, increasing the reach and ease of screening. The VAFOSQ is administered and completed quickly and can be incorporated as part of routine screening at a primary care clinic visit. The questionnaire includes 7 items: (1)smoking history, (2)previously diagnosed history of anxiety, (3)chest tightness, (4)frequency of breathing problems, (5)frequency of frustration, (6)cough, and (7) history of noisy breathing. Because, unlike other COPD screening questionnaires, we utilized the LLN (which is age dependent) instead of a fixed ratio as the FEV_1/FVC threshold for AFO, age was not a significant variable and was excluded from the final questionnaire. Some of

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Table 4. Comparison of Veterans Airflow Screening Questionnaire Scores in Patient Subsets

Patient Population	N	VAFOSQ Score (mean+SD)
Total Population	825	21.96+/- 8.08
No AFO: $FEV_1/FVC>LLN$	630	20.9+8.5
AFO:$FEV_1/FVC<LLN$	195	25.4+5.3
AFO Severity		
No AFO	630	20.9+8.5
Mild AFO:FEV_1>=80% Predicted	20	22.3+6.1
Moderate AFO:FEV_1<80% predicted	120	25.1+4.8
Severe/Very Severe AFO:FEV_1<50% predicted	55	27.2+5.2
Chronic Conditions		
COPD	163	26.6+5.4
Emphysema	76	27.3+4.8
Chronic Bronchitis	86	24.8+7.0
Gender		
Male	776	21.98+ 8.0
Female	49	21.67+ 8.8
Prescribed inhaler		
Yes	382	23.9+7.7
No	419	20.1+8.1

VAFOSQ: Veterans Airflow Obstruction Screening Questionnaire; SD: standard deviation; AFO: airflow obstruction; FEV_1: forced expiratory volume in 1 second; FVC: forced vital capacity; COPD: chronic obstructive pulmonary disease

the selected variables (history of anxiety) have not been included in previous COPD screening questionnaires; however, the combination of the 7 variables results in a highly predictive model. A weighted-sum of these items creates a score that differentiates between patients with and without AFO and the score magnitude correlates with COPD severity.

The VAFOSQ scores correlate well with the presence of AFO and higher VAFOSQ scores indicate an increased likelihood of AFO. The mean VAFOSQ score is lowest in patients with no AFO and it increases gradually from mild to moderate to severe AFO. It is highest in patients with very severe AFO. Lower VAFOSQ threshold scores increase the detection of patients with AFO (higher sensitivity) but are also positive in an increased number of patients with no AFO (lower specificity). A threshold of 25 results in a sensitivity of 59.9%, a specificity of 69.8% and an area under the ROC curve of 0.72. Other potential applications of this survey in different populations may require a higher or lower cutoff for increased sensitivity or increased specificity.

Patients with COPD often fail to seek medical care for a variety of reasons; their symptoms progress gradually and they limit their activities to cope with worsening respiratory impairment. They do not realize their limitations are abnormal and that their symptoms can be improved.[23] COPD is underdiagnosed by 25%-50% in Italy.[24] In Spain, only 60% of patients with respiratory symptoms are seen by a provider and only 45% of them undergo spirometry testing.[25] Up to 80% of all individuals with AFO and half with severe AFO are not diagnosed.[26] Similarly, within the VHA, approximately two-thirds of individuals with AFO are not diagnosed with COPD.[12] Thus, COPD remains an under-recognized and under-diagnosed disease despite the ready availability of spirometry for measurement of AFO.[4,27] Often, a COPD diagnosis is delayed until the condition is advanced.[28] Spirometry is a reliable, simple, non-invasive, safe, and non-expensive procedure but it continues to be underutilized in the diagnosis of COPD because universal AFO screening is not recommended.[20,27,29] COPD screening questionnaires have proven to be useful in selecting patients for further evaluation with spirometry and use of these questionnaires encourages targeted deployment of health care resources.[13-16] Screening questionnaires that can be self-administered may aid in earlier COPD diagnosis which may improve clinical outcomes.[28-30]

Among 342 patients hospitalized for the first time for a COPD exacerbation, 34% did not have a prior diagnosis of COPD and were not treated previously with any respiratory medication.[31] More of these previously undiagnosed patients quit smoking in the 3 months after hospitalization than did the diagnosed patients, 16%, versus 5%,[31] respectively. Patients diagnosed with AFO are more likely to quit smoking.[32-34] Patients diagnosed with COPD who quit smoking experience

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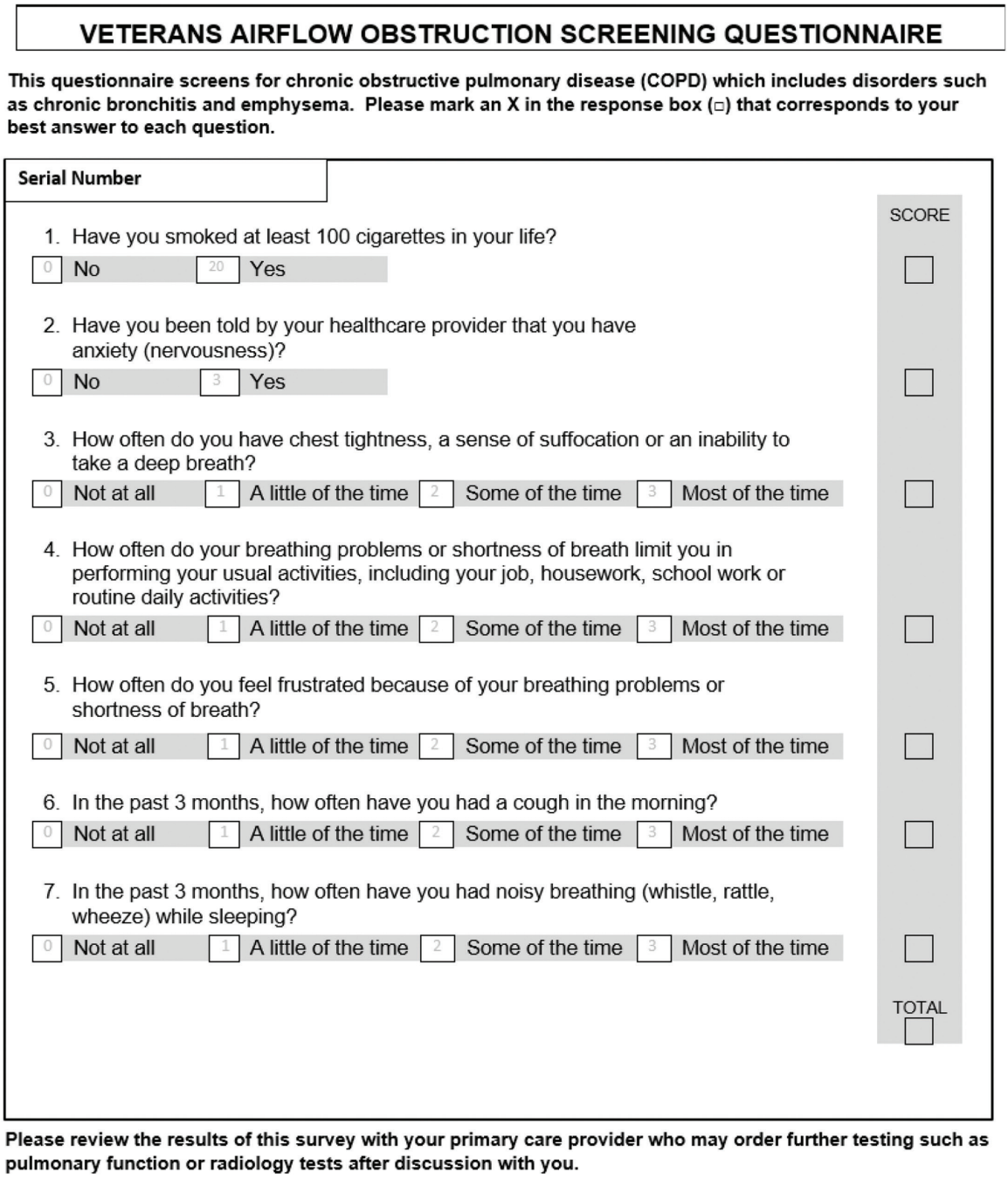
Figure 1. Veterans Airflow Screening Questionnaire



VETERANS AIRFLOW OBSTRUCTION SCREENING QUESTIONNAIRE

This questionnaire screens for chronic obstructive pulmonary disease (COPD) which includes disorders such as chronic bronchitis and emphysema. Please mark an X in the response box (□) that corresponds to your best answer to each question.

Serial Number

SCORE

1. Have you smoked at least 100 cigarettes in your life?
   0 No 20 Yes

2. Have you been told by your healthcare provider that you have anxiety (nervousness)?
   0 No 3 Yes

3. How often do you have chest tightness, a sense of suffocation or an inability to take a deep breath?
   0 Not at all 1 A little of the time 2 Some of the time 3 Most of the time

4. How often do your breathing problems or shortness of breath limit you in performing your usual activities, including your job, housework, school work or routine daily activities?
   0 Not at all 1 A little of the time 2 Some of the time 3 Most of the time

5. How often do you feel frustrated because of your breathing problems or shortness of breath?
   0 Not at all 1 A little of the time 2 Some of the time 3 Most of the time

6. In the past 3 months, how often have you had a cough in the morning?
   0 Not at all 1 A little of the time 2 Some of the time 3 Most of the time

7. In the past 3 months, how often have you had noisy breathing (whistle, rattle, wheeze) while sleeping?
   0 Not at all 1 A little of the time 2 Some of the time 3 Most of the time

TOTAL

Please review the results of this survey with your primary care provider who may order further testing such as pulmonary function or radiology tests after discussion with you.

The Veterans Airflow Screening Questionnaire (VAFOSQ) is an easy to complete, self-administered survey. The respondent places an X in the box corresponding to his/her answer to each question. Beneath each box is a numerical score which is written in the box on the far right of each line. These scores are summed to obtain the total score in the bottom right hand box. A score of 25 or greater predicts the presence of airflow obstruction.

an improvement in FEV_1 in the first year after quitting and the subsequent rate of FEV_1 decline is half the rate of continuing smokers and comparable to that of never-smokers.[34,35] Thus, earlier diagnosis of AFO improves smoking cessation preserving lung function and improving quality of life.[5]

Primary care physicians' assessments of their patients' COPD severity are inaccurate for 70% of patients with

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Table 5. Performance of Different Veterans Airflow Screening Questionnaire Total Score Thresholds in the Development Cohort

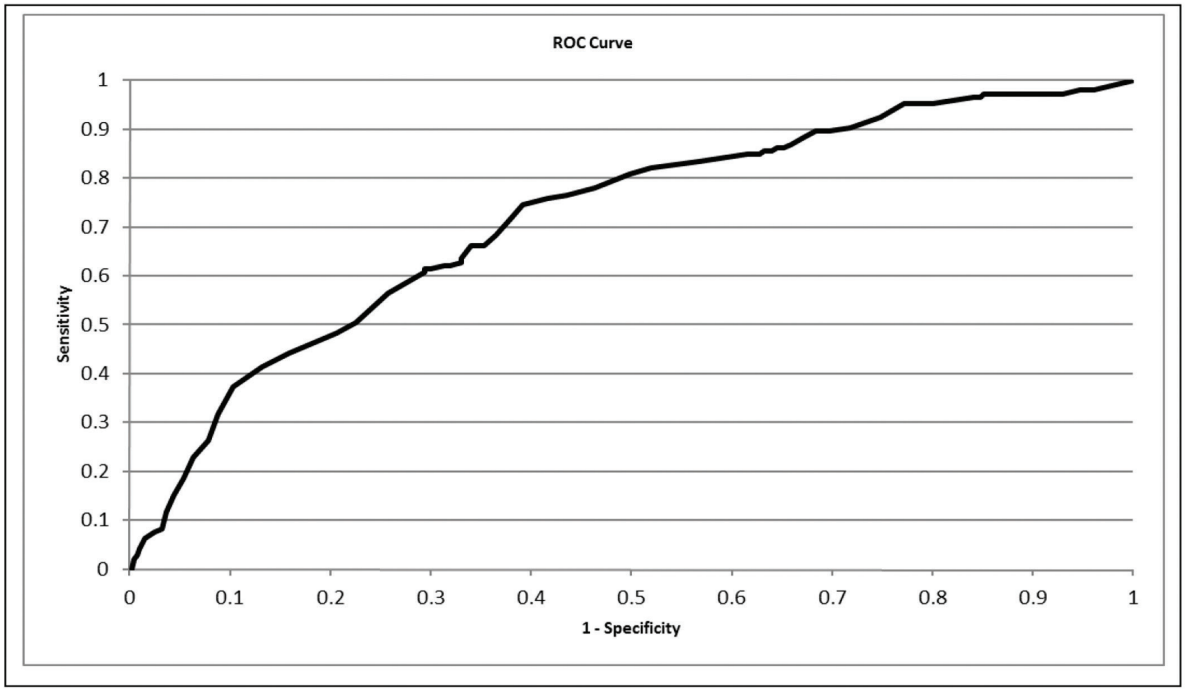
Total Score	Odds Ratio	Sensitivity	Specificity	PPV	NPV	% Correctly Classified
20	7.3	97.4%	16.0%	26.4%	95.3%	33.9%
21	5.3	92.3%	30.6%	29.2%	92.8%	43.9%
22	3.4	82.0%	43.1%	30.8%	88.6%	50.5%
23	3.2	74.7%	52.3%	32.6%	87.0%	55.6%
24	3.3	66.3%	62.8%	35.4%	85.9%	61.7%
25	3.5	59.9%	69.8%	37.7%	85.1%	65.6%
26	3.0	49.5%	75.5%	38.2%	83.0%	67.4%
27	2.6	40.3%	79.5%	37.4%	81.4%	68.4%
28	2.4	33.0%	82.8%	36.8%	80.3%	69.0%
29	2.0	25.7%	85.5%	35.0%	79.1%	69.3%

PPV: positive predictive value; NPV: negative predictive value; ROC: receiver operator characteristics

COPD and underestimate the severity of disease in 41 percent.[36] When these patients undergo spirometry, physicians change their severity assessments for 30% of patients and modify treatment in 37 percent.[36] In addition to smoking cessation, long-acting bronchodilators may reduce the rate of lung function decline, decrease COPD exacerbation and mortality rates, and improve health-related quality of life in individuals with mild to moderate AFO.[34] Exercise training may increase exercise endurance in patients with mild to moderate COPD.[37] Thus, diagnosis of AFO may prompt initiation of both pharmacologic and non-pharmacologic treatments which may reduce the morbidity and mortality associated with COPD.

Based upon a systematic review of the benefits and harms of COPD screening, the U.S. Preventive Services Task Force recommends against screening asymptomatic adults for COPD.[38] However, the World Health Organization statement on the Global Alliance for Respiratory Disorders and the American College of Physicians suggest screening spirometry for at risk or symptomatic individuals.[39,40] Questionnaires have been advocated for the identification of at risk individuals. The "Screening, Evaluating and Assessing

Figure 2. ROC Curve



ROC: receiver operating characteristics

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Rate Changes of Diagnosing Respiratory Conditions in Primary Care 1 (SEARCH 1)" study showed that use of the COPD Population Screener alone or with a handheld spirometer significantly increased the COPD diagnostic yield among primary care patients, 0.49%, 1.07%, and 1.16%, control, survey alone, and survey plus spirometer, respectively.[41] Empiric diagnosis of COPD based upon history and symptoms is often incorrect. Among 3209 Veterans treated empirically for COPD, only 62% had AFO. Older age, ever smoking, and underweight were associated with AFO whereas congestive heart failure, depression, diabetes, obesity, and sleep apnea were not.[42]

Existing questionnaires for the identification of individuals at risk for AFO have been developed and validated in the general population. However, the VHA patient population is significantly different from the general population. It is older, overwhelmingly male, and has a higher prevalence of smoking and airways obstruction.[12] For these reasons, a questionnaire designed for a VHA patient population can be expected to have a lower false positive and a higher sensitivity and specificity in this population. Further, prior questionnaires have used a fixed ratio threshold for the definition of AFO; the VAFOSQ is the first screening survey to utilize the LLN threshold for AFO.

A limitation of our study includes the recruitment of participants from VHA primary care clinics. Recruited patients were presenting for an already scheduled primary care clinic visit for general medical problems which might confound the diagnosis of AFO. All patients were offered screening spirometry but patients with respiratory symptoms might be more likely to participate resulting in a higher prevalence of AFO in our cohort than in the general VHA patient population.

The VAFOSQ is a reliable and valid instrument for the identification of veterans at risk for AFO who would benefit from further evaluation with spirometry. The VAFOSQ is straightforward to use and can be easily self-administered and self-scored enabling widespread application throughout the VHA and, perhaps, the Department of Defense.

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Declaration of Interest

The authors have no relevant interests to declare.

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