Original Research

Prospective COPD Case Finding in a Lung Cancer Screening Program: A Pilot Study

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Abstract

Background

Chronic Obstructive Pulmonary Disease (COPD) remains underdiagnosed and undertreated. Because screening asymptomatic individuals for COPD is not recommended, several case-finding tools have been explored. The CAPTURE questionnaire and peak expiratory flow rate (PEFR) (CAPTURE tool) have been tested in the primary care setting, with disappointing results. We hypothesized that these tools could yield better results in a lung cancer screening (CTLS) program, where subjects have a history of cigarette smoking and higher prevalence of COPD.

Methods

We recruited 67 patients referred to a CTLS program at a single institution. Participants completed the CAPTURE and COPD Assessment Test (CAT) questionnaires. Spirometric testing was completed with a portable device and low dose chest CT was performed according to a standard protocol.

Results

The group's mean age was 66 $\pm$7 years, 43% were male, with 37 pack years smoking history. Eighteen (27%) had COPD (FEV_1 of 60 $\pm$ 22 % predicted) and a higher CAT score [12 (IQR 6-15)] compared to the non-obstructed group [CAT = 7 (IQR 3-10)], $p<0.02$. Combining CAPTURE questionnaire with PEF generated the best COPD diagnostic criteria (Sensitivity=0.82, Specificity=0.73, AUROC=0.784), followed by combining CAPTURE questionnaire and emphysema presence; sensitivity of 0.73 and specificity of 0.71 and AUROC of 0.779. The CAPTURE questionnaire alone had a sensitivity of 0.766 and specificity of 0.616 AUROC of 0.669.

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Conclusions

The CAPTURE tool is an effective method to find COPD cases in lung cancer screening. A CT diagnosis of emphysema can substitute peak flow in this population.

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Introduction

A large proportion of patients with COPD remain undiagnosed, both in epidemiologic studies and at primary care settings [1] . This is not unique to the USA, as the prevalence of COPD in 27 countries was 9.7% and of these, 81 % were undiagnosed [2]. This is a problem, because undiagnosed patients have similar impaired quality of life, reduced activities of daily living [3], increased health care utilization, compared to those patients with a COPD diagnosis [4].

Several factors have been identified as reasons for the underdiagnosis, including patient-related under-recognition and reporting of their symptoms; health care system associated problems such as lack of access to spirometry, and lack of quality health care in middle and low income countries. Lastly, health care provider related factors like poor understanding of diagnostic criteria and inadequate referral to specialist, also play an important role.[5]

The US Preventive Services Task Force (USPSTF) recommends not to screen asymptomatic individuals for the COPD diagnosis because of lack of evidence of any health care benefit when cases are detected [6]. An alternative to find undiagnosed patients is to implement a case finding strategy[7], which involves assessment of respiratory symptoms and disease risk factors before making a determination whether or not further testing is required. One such strategy, using random telephone calls which involves the assessment of the presence of respiratory symptoms to offer spirometric screening of detection of airflow obstruction, has now been shown to improve health outcomes in patients with asthma and COPD [8].

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Active case finding involves the use of questionnaires to elicit respiratory symptoms in a target population at risk for COPD [5]. Another technique is to use handheld devices that can measure peak expiratory air flow, thus facilitating a precise diagnosis of airway obstruction, particularly useful in resource-limited settings [9]. Combined tools have shown a better diagnostic yield than either method alone [10]. One such questionnaire, the COPD Assessment in Primary Care to identify Undiagnosed Respiratory Disease and Exacerbation Risk (CAPTURE)screening tool, is a 5 symptom and exposure questionnaire, that is combined with peak expiratory flow rate (PEF) with sex specific thresholds to detect undiagnosed patients who may benefit from initiating therapy[11]. The initial positive study involving this approach was tested in specialty clinics [11] and subsequently in primary care practices [12]. In this last context, a total of 4,325 patients from primary care practices were enrolled and the study finally reported a sensitivity of 48% and a specificity of 89% (AUC: 0.81) to diagnose patients with clinically significant COPD. This low yield is perhaps explained by the fact that close to 50% of participants had no history of smoking and hence were unlikely to have COPD.

Undiagnosed COPD is quite prevalent in patients participating in a lung cancer screening program [13-15]. However, there are limited reports of active case findings studies in this population, and none combining a symptoms questionnaire with a simple peak flow determination. We hypothesized that combining the CAPTURE questionnaire and PEF in a lung cancer screening population, could be an effective strategy to detect patients with COPD, who could benefit from secondary and tertiary preventive measures. In addition, we also explored whether the presence of emphysema in the chest computed tomography (CT) completed as part of the lung cancer screening performed differently than the peak flow meter cut-off in

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determining the presence of clinically significant COPD. This latter strategy would have value for those settings where access to peak flow meter may not be available.

Methods

Study design

This study was completed at Lahey Hospital and Medical Center, Burlington, Massachusetts. Patients were recruited between January 2023 and June of 2024, if they were referred by a primary care provider from our institution to be enrolled in the chest CT lung cancer screening program (CTLS). We performed spirometry in 76 subjects, 67 of them had acceptable spirometry quality and were included in the study. They had no prior diagnosis of COPD, had not performed a pulmonary function test (corroborated by reviewing our electronic medical record system, EMR) and were current or previous smokers with at least a 30-pack year smoking history. Patients were excluded if they did not sign the consent form, did not complete the questionnaires, cancel the appointment or were non-English speakers. The study was approved by the Institutional Review Board. All participants signed a consent form.

The Measurements

The day of the visit, subjects completed a personal data form including, anthropometrics, past medical history, CAPTURE and COPD Assessment Test (CAT) questionnaires [11,16] The CAPTURE questionnaire was self-completed by all patients. The score ranges from 0 to 6, with higher scores reflecting higher exposure to dirty polluted air, smoking or dirt, breathing changes with weather or air quality, breathing difficulty with activity, tiring easily compared to others

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similar age and missing work, school or other activities due to bronchitis, pneumonia or colds. The CAT questionnaire is a multidimensional 8-item questionnaire that assesses the health status in patients with COPD. The score ranges from 0-40. It is recommended that patients with a score ≥ 10 should be considered for regular treatment. Participants performed pre bronchodilator spirometry following standard of practice [17] using an Easy On spirometer (ndd Medical Technologies Inc) performed by study personnel trained in spirometry performance. The best of at least three maneuvers was reported. Spirometric values, including peak expiratory flow values were interpreted using the National Health and Nutritional Examination Survey prediction equations[18] incorporated in the hand-held spirometer software for interpretation. Subsequent to this evaluation, a low dose chest CT was completed. Patients and providers were informed of the results.

The definition of a positive screening included a CAPTURE questionnaire score of 5 or 6 or the combination of a score of 2-4 with a peak expiratory flow rate of <250 for women and 350 L/min for men. Besides the spirometric evidence of airflow limitation, clinically significant COPD was defined as patients with a COPD Assessment Test (CAT) equal to or higher than 10 (15). The presence or absence of emphysema was defined by the report from the blinded radiologist. Emphysema was quantified on the baseline screening CT scan as the percent low attenuation area (%LAA), defined as the percentage of lung volume with voxel density less than –950 Hounsfield units, using automated densitometry software (4DMedical). Data was stored in a secure server (REDCap)

Statistical Analysis

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The continuous variables were tested for the data distribution normality using Shapiro-Wilk test. Normally distributed data were tested using unpaired Student T test and displayed as mean ± standard deviation. The skewed data were tested using Wilcoxon Rank-Sum test and displayed as median and interquartile range (IQR). The categorical variables were compared using Fisher's Exact test. The comparison with $p \leq 0.05$ was considered significantly different. A Receiver Operating Characteristic Curve (ROC) was generated for each criterion. The statistical analysis for this study was generated using Statistical Analysis Software (SAS), version 9.4 for Windows (SAS Institute Inc., Cary, NC, USA).

Results

The clinical characteristics of the study patients are shown in Table 1. The 67 recruited patients had a mean age of 66 $\pm$ 7 (y), 57 % were female with smoking history of 37 (30-50) pack/ year, 69% were ex-smokers abstinent for 14 $\pm$ 10 year. A total of 27% of subjects screened, had evidence of moderate airflow obstruction (FEV_1 of 60 $\pm$ 22 % predicted), with significantly lower peak expiratory flow and a numerically higher CAPTURE questionnaire score (2 vs 1). They were also more likely to have clinically significant COPD as demonstrated by a mean CAT score of 12 vs. 7 for the non-COPD group . The Charlson comorbidity index was similar in both groups.

More patients in the COPD group had radiologic evidence of emphysema as assessed by the blinded radiologist reporting the chest CT scan (61 vs. 29%). Further densitometry analysis showed a similar distribution in the upper, mid or lower lung areas between obstructed and non-obstructed groups, as shown in Table 1.

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Figure 1 shows the receiving operator curve estimating the best point to describe the ideal combination of sensitivity and specificity to signal a COPD diagnosis. As seen in the figure, the combination of CAPTURE questionnaire score of 2-4 combined with a peak expiratory flow rate of <360 L/min in men and <260L/min in women was able to diagnose clinically significant COPD with a sensitivity of 82% and a specificity of 73%. The AUC was 0.784. The combination of a CAPTURE questionnaire score of 2-4 combined with the presence of emphysema was able to diagnose clinically significant COPD with a sensitivity of 79% and a specificity of 73%. The AUC was 0.779 (results not shown). We compared best discerning points on both AUC curves and found no statistically different in the capacity of both test combinations to diagnosed clinically significant COPD (McNemar's test p= 1.000).

Discussion

This pilot study reports, for the first time, the performance of combining 2 different case finding strategies on COPD diagnosis in a high-risk population of patients participating in a lung cancer screening program. Combining the scores of the CAPTURE questionnaire with a peak flow meter test helps select individuals likely to have clinically significant COPD. Additionally, using a CAPTURE questionnaire in combination with the presence of emphysema in a chest CT scan could serve as an alternative to performing a peak flow measurement, in sites where PEF may not be available.

COPD is an important health problem in the USA, with an estimated prevalence of approximately 13%; however, 71 % of those persons remain undiagnosed, with little

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improvement in a 20 -year period[19]. Given the lack of evidence supporting the benefit of spirometric screening for COPD in the general population, the United States Preventive Services Task Force has recommended against screening, as a tool to of any use to close this large diagnostic gap [6] However, case finding in selected populations, as is done for example in lung cancer screening, does challenge the position of the USPSTF[7]. Further, recent evidence provided by a large Canadian study indicates that using the presence of respiratory symptoms determined via telephone calls and screening those persons responding positively to the questions, it was possible to detect individuals with asthma or COPD. Importantly, the randomization of those detected sick persons to receive guided education and pharmacological therapy compared with usual care, was effective in improving health related outcomes [8].Unfortunately, the methodology used in this study, random digit dialing is relatively expensive and inefficient.

One potential approach to improve COPD case finding has been the development of questionnaires to detect persons likely to have the disease. One such questionnaire, the CAPTURE, has received significant attention because of its careful development and validation [11]. However, in a large study conducted in the primary care setting, its performance failed to replicate the positive results of the original reports [12]. Of note, the majority, (58%) of those subjects included in the study were never smokers and only 12 % had a history of active smoking, making them unlikely to have obstruction to airflow[12]. Therefore, it is not surprising that more efforts are required to close the gap between patients with spirometry diagnosis of COPD and those who remain symptomatic but undiagnosed.

Tobacco smoking is the most important cause of COPD in susceptible subjects in the United States. Therefore, studying a population with higher tobacco use should be more efficient to find

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undiagnosed patients with COPD than screening a general population. The criteria for lung cancer screening requires participants to be current or former smokers, with an age and smoking history where it is likely that susceptible individuals to cigarette smoke would have obstruction to airflow and symptomatic COPD. This may help explain why our study had a higher sensitivity (82%) compared to the 42% reported by Martinez et al. in the primary care setting [12]. Our population had 100% history of tobacco use with a minimum of 30 pack/year history compared to 42% reporting ever using tobacco in the study by Martinez et al.

Another important finding in this pilot study, is the potential use of presence of emphysema as assessed by CT scan, in helping select individuals likely to have COPD. This finding could positively impact on the implementation of screening tools in CTLS programs, where performance of a peak flow measurement could be difficult due to reduced resources and lack of personnel able to perform the PEF measurement. A CAPTURE questionnaire could be provided to all participants and those with two or more positive questions and presence of emphysema on the CT could be referred to pulmonary function testing. The presence of emphysema coupled with the CAPTURE questionnaire score of 2-4, has a similar sensitivity and specificity than the use of CAPTURE tool, with a non-statistical different AUC. This selection process would also reduce the number of participants in a CTLS program that need to perform a pulmonary function test. As we previously showed, the presence of emphysema should be part of the standard CTLS report. Its presence has been associated with increased risk of COPD related hospitalization[20]. This information is also in line with the Lancet Commission on COPD that suggest to move beyond the reliance on spirometry to identify patients with obstructive lung disease.[21]

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The diagnosis of COPD has also been shown to positively affect tobacco cessation [22]. We can speculate that an additional benefit of finding COPD patients in a CTLS program is to advise them of their higher likelihood of developing lung cancer in the future. As previously reported by de Torres et al, patients with COPD diagnosis and evidence of emphysema have up to 3.5 higher risk of developing lung cancer[23-25] than subjects without those findings, particularly among women and those with milder obstructive disease.

Our study has several limitations. First, it was performed in a single center with a well-established CTLS program. However, we believe this simple approach to COPD diagnosis could be replicated in other programs combining the use of the CAPTURE questionnaire in all subjects being screened and performing a peak flow maneuver instead of spirometry, or else combining the questionnaire and the presence of emphysema. We believe the substantial yield justifies the effort. Second, we enrolled a small number of participants compared to previous studies using the CAPTURE questionnaire and peak flowmeter measurements [11,12,26]. However, we showed significantly positive screening results to identify patients with clinically significant COPD that would benefit from intervention[27] with a higher yield (sensitivity and specificity) compared to larger studies completed in primary care settings[12] . A positive result in a relatively small number of subjects supports an important clinical value. Third, we do not know if the COPD diagnosis influences patient behavior and treatment, as this study was not planned to follow patients after the intervention to determine if tobacco cessation and bronchodilator therapy prescription was implemented. However, further intervention studies are urgently needed given the positive results of the case finding study reported by Aaron et al[8] in symptomatic patients recruited using telephone calls in Canada. Fourth, a larger sample may allow us to perform further analysis

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regarding the emphysema severity and location and its relationship to the COPD diagnosis and the clinical implications of different emphysema distribution[20]

In summary, we demonstrated that the use of CAPTURE questionnaire combined with peak flow meter measurement is an effective tool to diagnose clinically significant COPD. The presence of emphysema on the chest CT could be used in CTLS programs where the peak flow measurement might be difficult to obtain. Case finding in persons participating in lung cancer screening programs should help close the large underdiagnosis gap of COPD currently present in the United States.

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References

1. Diab N, Gershon AS, Sin DD, et al. Underdiagnosis and Overdiagnosis of Chronic Obstructive Pulmonary Disease. *Am J Respir Crit Care Med.* 2018;198(9):1130-1139.
2. Lamprecht B, Soriano JB, Studnicka M, et al. Determinants of underdiagnosis of COPD in national and international surveys. *Chest.* 2015;148(4):971-985.
3. Miravitlles M, Soriano JB, Garcia-Rio F, et al. Prevalence of COPD in Spain: impact of undiagnosed COPD on quality of life and daily life activities. *Thorax.* 2009;64(10):863-868.
4. Labonte LE, Tan WC, Li PZ, et al. Undiagnosed Chronic Obstructive Pulmonary Disease Contributes to the Burden of Health Care Use. Data from the CanCOLD Study. *Am J Respir Crit Care Med.* 2016;194(3):285-298.
5. Aaron SD, Montes de Oca M, Celli B, et al. Early Diagnosis and Treatment of Chronic Obstructive Pulmonary Disease: The Costs and Benefits of Case Finding. *Am J Respir Crit Care Med.* 2024;209(8):928-937.
6. Webber EM, Lin JS, Thomas RG. Screening for Chronic Obstructive Pulmonary Disease: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2022;327(18):1812-1816.
7. Celli B. Screening for COPD: Challenging the United Sates Preventive Services Task Force Recommendation. *Chest.* 2023;163(3):481-483.
8. Aaron SD, Vandemheen KL, Whitmore GA, et al. Early Diagnosis and Treatment of COPD and Asthma - A Randomized, Controlled Trial. *N Engl J Med.* 2024.

Published online August 29, 2025 https://doi.org/10.15326/jcopdf.2025.0636

9. Gershon AS, Hwee J, Croxford R, Aaron SD, To T. Patient and physician factors associated with pulmonary function testing for COPD: a population study. *Chest.* 2014;145(2):272-281.

10. Soriano JB, Molina J, Miravitlles M. Combining case-finding methods for COPD in primary care: a large, two-stage design study. *Int J Tuberc Lung Dis.* 2018;22(1):106-111.

11. Martinez FJ, Mannino D, Leidy NK, et al. A New Approach for Identifying Patients with Undiagnosed Chronic Obstructive Pulmonary Disease. *Am J Respir Crit Care Med.* 2017;195(6):748-756.

12. Martinez FJ, Han MK, Lopez C, et al. Discriminative Accuracy of the CAPTURE Tool for Identifying Chronic Obstructive Pulmonary Disease in US Primary Care Settings. *JAMA.* 2023;329(6):490-501.

13. Mets OM, Buckens CF, Zanen P, et al. Identification of chronic obstructive pulmonary disease in lung cancer screening computed tomographic scans. *JAMA.* 2011;306(16):1775-1781.

14. de-Torres JP, Wisnivesky JP, Bastarrika G, Wilson DO, Celli BR, Zulueta JJ. The Prevalence of Obstructive Lung Disease in a Lung Cancer Screening Cohort: Analysis of the National Lung Screening Trial-American College of Radiology Image Network Cohort. *Ann Am Thorac Soc.* 2019;16(5):641-644.

15. de-Torres JP, Celli BR. COPD detection in lung cancer screening programmes: "hitting two birds with one stone". *Eur Respir J.* 2022;60(6).

Published online August 29, 2025 https://doi.org/10.15326/jcopdf.2025.0636

16. Jones P, Harding G, Wiklund I, Berry P, Leidy N. Improving the process and outcome of care in COPD: development of a standardised assessment tool. *Prim Care Respir J.* 2009;18(3):208-215.

17. Miller MR, Hankinson J, Brusasco V, et al. Standardisation of spirometry. *Eur Respir J.* 2005;26(2):319-338.

18. Hankinson JL, Odencrantz JR, Fedan KB. Spirometric reference values from a sample of the general U.S. population. *Am J Respir Crit Care Med.* 1999;159(1):179-187.

19. Martinez CH, Mannino DM, Jaimes FA, et al. Undiagnosed Obstructive Lung Disease in the United States. Associated Factors and Long-term Mortality. *Ann Am Thorac Soc.* 2015;12(12):1788-1795.

20. Gazourian L, Thedinger WB, Regis SM, et al. Qualitative emphysema and risk of COPD hospitalization in a multicenter CT lung cancer screening cohort study. *Respir Med.* 2021;176:106245.

21. Stolz D, Mkorombindo T, Schumann DM, et al. Towards the elimination of chronic obstructive pulmonary disease: a Lancet Commission. *Lancet.* 2022;400(10356):921-972.

22. Tashkin DP, Murray RP. Smoking cessation in chronic obstructive pulmonary disease. *Respir Med.* 2009;103(7):963-974.

23. de Torres JP, Marin JM, Casanova C, et al. Lung cancer in patients with chronic obstructive pulmonary disease-- incidence and predicting factors. *Am J Respir Crit Care Med.* 2011;184(8):913-919.

24. de-Torres JP, Wilson DO, Sanchez-Salcedo P, et al. Lung cancer in patients with chronic obstructive pulmonary disease. Development and validation of the COPD Lung Cancer Screening Score. *Am J Respir Crit Care Med.* 2015;191(3):285-291.

Published online August 29, 2025 https://doi.org/10.15326/jcopdf.2025.0636

25. de-Torres JP, Alcaide AB, Campo A, et al. Lung Cancer Screening in People With COPD: The Pamplona-IELCAP Experience. *Arch Bronconeumol.* 2024;60(2):95-100.

26. Li Y, Wen F, Ma Q, et al. Use of CAPTURE to Identify Individuals Who May or May Not Require Treatment for Chronic Obstructive Pulmonary Disease. *Am J Respir Crit Care Med.* 2023;208(4):435-441.

27. GOLD GIfCOLD. GLOBAL STRATEGY FOR PREVENTION, DIAGNOSIS AND MANAGEMENT OF COPD: 2024 Report. 2025; https://goldcopd.org/2025-gold-report/. Accessed 24 Nov 2024, 2025.

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Table 1 Characteristics of the 67 subjects undergoing lung cancer screening who participated in this pilot study.

Characteristics	**Obstruction N=18**	**No obstruction N=49**	**p value**
Age, mean±std[a]	66±8	66±6	0.86[b]
Male, n/N(%)	39%	45%	0.78[c]
Smoking status: Former=1 Current=2	 33% 67%	 82% 18%	0.0001[c]
Former smoker quit years	17±11	14±10	0.61[b]
PackYears	43	36	0.22[e]
FEV_1 predicted, mean±std	60±22	89±16	<.0001[b]
FEV_1(L)	1.87±0.71	2.47±0.65	0.002[b]
Peak Expiratory Flow (L/min)	236±96	371±127	0.0001[b]
CAPTURE QUESTIONNAIRE	2(1-3)	1(1-3)	0.5[e]
CAT, median (IQR[d])	12(6-15)	7(3-10)	0.02[e]
Charlson Index, median (IQR[d])	0(0-1)	1(0-1)	0.66[e]
Emphysema	61%	29%	0.02[c]
Density Below -910	15±11	13±11	0.53[b]
Density Below -920	9±9	8±8	0.65[b]
Density Below -950	1.9±3.3	1.6±2.1	0.75[b]

[a]Standard deviation [b]Student's T Test [c]Fisher's Exact Test [d]Interquartile Range [e]Wilcoxon Rank Sum Test

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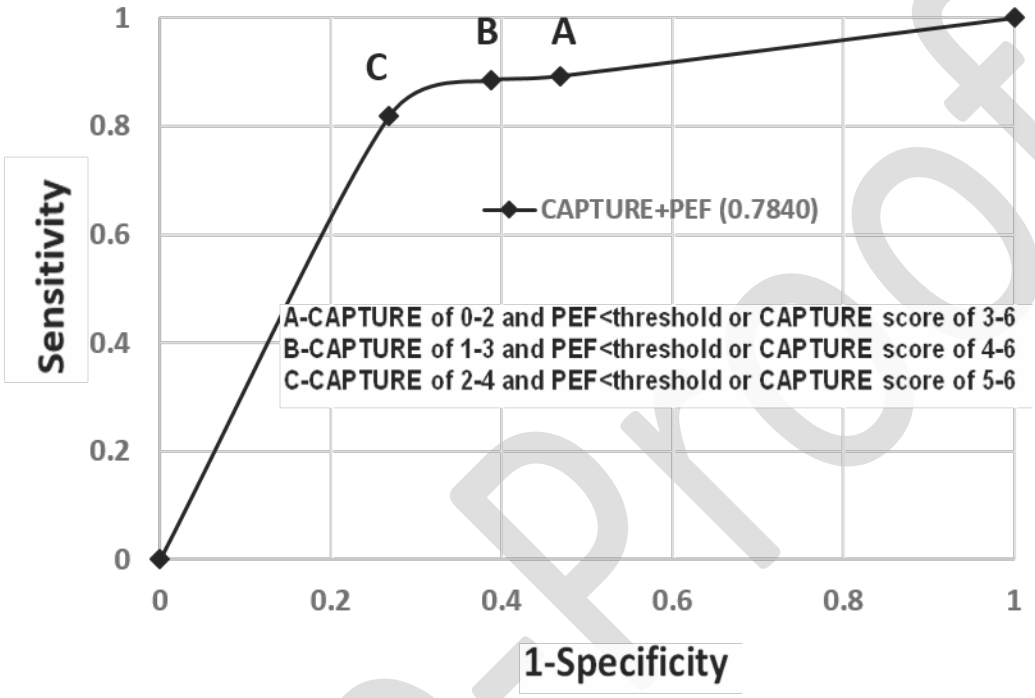
Figure 1 Receiver Operating Characteristic curve for detecting obstruction using a combination of the CAPTURE questionnaire and the peak expiratory flow (PEF). The optimum point is at C (sensitivity=82%, specificity=73%)



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