Review Article
Published: 23 Jun, 2020

SF Journal of Pulmonology and Respiration Care

Screening of High-Risk Patients for Chronic Obstructive Pulmonary Disease in Primary Care: A Narrative Review

Athilingam P, Bugajski A and Menon U*

College of Nursing, University of South Florida, Tampa, Florida, USA

Abstract

Chronic Obstructive Pulmonary Disease (COPD) predominantly affects older adults, and claimed 3 million lives in 2016, making it the third leading cause of death worldwide. Over 35 million Americans aged 40 or older have lung function consistent with diagnosable COPD. COPD and Cardiovascular Disease (CVD) have a bidirectional relationship, in that one is a risk factor for developing the other. National and international consortiums recommend early screening of adults at risk of COPD, such as those with CVD. Recommended screening strategies include screening tools to assess symptoms, medical history, and handheld spirometry. Handheld spirometry has high diagnostic accuracy and if impaired lung function is indicated, these patients are referred for Pulmonary Function Testing (PFT), the diagnostic gold standard for COPD.

There is no clinical consensus, however, for pulmonary screening in people with CVD.

Current knowledge relating to the prevalence and incidence of CVD in people with COPD and the mechanisms that underlie their coexistence is key in combating the global burden of COPD.

Keywords: Chronic obstructive pulmonary disease; High risk; Screening; Cardiovascular disease

Introduction

In the United States, the estimated prevalence of diagnosed Chronic Obstructive Pulmonary Disease (COPD) ranges from 7%-9% of the population [1]. It is estimated that an additional 6% of the population has COPD and does not know it [2]. There is a high comorbidity burden in those with COPD, where patients can average 3 to 7 comorbid diseases. Over half of all comorbidities observed in those with COPD are Cardiovascular Diseases (CVD). According to World Health Organization (WHO)CVD and COPD are among the top four causes of mortality accounting for approximately 21.5 million deaths/year world [3]. This narrative review presents the risk factors and rationale for lung screening among high risk patients.

Risk Factors for Developing COPD

CVD and COPD share a number of commonalities that include the age of the affected population, cigarette smoking as a risk factor, presence of systemic inflammation, periodic episodes of disease exacerbation that require hospitalization, and dyspnea as a prominent symptom [4]. A meta-analysis of observational studies supports a two-fold increase in the odds of having CVD in people with COPD compared to COPD-free patients (odds ratio [OR]=2.46; 96% CI; 2.02-3.00) [5]. Researchers performed spirometry evaluation of patients (n=133) who had percutaneous coronary intervention for ischemic heart disease [6]. Among those, 24.8% met the spirometric criteria for COPD, of which 81.8% were undiagnosed [6]. Patients with COPD had greater mortality rate [HR 8.85; CI 95% (1.76-44.47) p=0.008]. Mortality was high, even among those without a previous diagnosis of COPD [HR 1.78; CI 95% (1.12-2.83) p=0.01] after adjustment for possible confounding variables [6]. This confirms that the prevalence and under diagnoses of COPD among patients with CVD are high with an increased mortality rate. Moreover, the coexistence of COPD and CVD is associated with worse outcomes than either condition alone [7].

Burden of Chronic Illness

Overall, patients with COPD have a two to three-fold increased risk of CVD compared to age-matched controls when adjusted for tobacco smoking [6]. Combination of COPD and comorbid CVD was associated with a 2.8 times greater likelihood of worse quality of life, and a dyspnea burden 2 to nearly 3 times greater than those with HF only [8]. Thus, CVD and COPD have a high symptom burden, poor outcomes, and require significant healthcare utilization. The National

OPEN ACCESS

***Correspondence:**
Ponrathi Athilingam, College of Nursing, University of South Florida, Tampa, Florida, USA.
Tel: *(813) 974-7526*
E-mail: *pathilin@usf.edu*

Received Date: *01 Jun 2020*
Accepted Date: *19 Jun 2020*
Published Date: *23 Jun 2020*

Citation: *Athilingam P, Bugajski A, Menon U. Screening of High-Risk Patients for Chronic Obstructive Pulmonary Disease in Primary Care: A Narrative Review. SF J Pulmonol Resp Care. 2020; 1(1): 1002.*

Longitudinal Mortality Study included 357,420 smokers and reported a higher risk of deaths due to COPD (HR, 7.66; 95% CI, 6.09-9.64) cardiovascular disease (HR, 1.24; 95% CI=1.11-1.39), cerebrovascular or stroke (HR, 1.39; 95% CI=1.12-1.74), and lung cancer (HR, 6.24; 95% CI=5.17-7.54) [9]. Furthermore, those with COPD also had higher cardiovascular morbidity and mortality rates than the general population (standardized rate ratios of 1.9 and 2.0, respectively) among those with CVD, heart failure unsurprisingly represented the most frequent cause of hospitalization (58.8 per 1,000 Per Year) [10]. About 40% of patients with mild to moderate COPD died due to CVD, which is 8-10 times more than deaths due to respiratory failure [11].

The economic burden associated with CVD and COPD is substantial and with the estimated costs exceeding $50 billion dollars annually, without considering the direct and indirect costs of comorbidity, economic disruptions (days lost to work) and premature death [12]. Therefore, considerable effort is placed in identifying those with chronic disease early, as a method to intervene in early disease states and save healthcare expenditures. One such method is Pulmonary Function Testing (PFT), which is the gold standard for the identification, diagnosis and assessment of those with COPD - although highly effective, mass screening using this tool remains controversial due to the resources needed to conduct these tests (Global Initiative for Obstructive Lung Disease (GOLD) [13].

Recent efforts focus on screening more people at a rigorous level while keeping patient and provider demands/costs low; this inherently involves methods other than PFTs. The GOLD guidelines recommend using symptom assessment, history and exacerbation history instead of spirometry screening for potential identification; of note, GOLD only recommends PFTs when disease is apparent or highly suspected [12]. The US Preventive Services Task Force (USPSTF) does not endorse screening for COPD in asymptomatic adults because they state this practice does not alter the course of the disease or improve patient outcomes - however this is largely unfounded in people at high risk for developing COPD such as those with CVD [12].

Previous Research on Screening for COPD

The diagnosis of COPD is based on objective airflow limitation, defined as a Forced Expiratory Volume in one second (FEV1)/ forced vital capacity ratio of less than 0.70 with less than 12 percent reversibility, in association with risk factors (e.g., smoking history) and/or symptoms (e.g., chronic sputum production, wheezing, dyspnea). Although smoking increases the risk of CVD and COPD, patients are still not routinely screened for COPD until there is a 20-pack year history [13]. Moreover, history and clinical examination alone are not accurate predictors of airflow limitation, and most persons with airflow obstruction do not recognize or report symptoms [14]. Current research has attempted to close the gap of screening of those with unrecognized disease by implementing a less intensive, more readily available measure of lung function using smart phone-based spirometry [15]. Despite these efforts, screenings among asymptomatic, high risk individuals are not recommended - even though earlier identification of patients with clinically significant history could improve access to care and prevent disease progression. According to NHANES 2007-2012 data, more than 70% of Americans aged 20 to 79 years with spirometry-confirmed obstruction were not previously diagnosed with COPD, which speaks to the prevalence of undiagnosed disease [16].

Given the extent of undiagnosed clinically significant COPD, researchers have explored case-finding as a potential approach in a range of different target groups. However, the best approach for identifying undiagnosed cases is not known. Case - findings in primary care setting is recommended in a systematic review, particularly among high risk individuals [17]. This was supported in a qualitative study that the case - finding method of COPD screening was acceptable, but participants feared stigma attached to smoking [18]. The American Thoracic Society guideline indicates that the findings on physical examination had high sensitivity (90%) but poor specificity for airflow obstruction [19].

Diagnosis and Classification of COPD

A diagnosis of COPD is often suspected in patients with risk factors: history of smoking, dyspnea with exertion or at rest, cough with or without sputum production, and/or a history of wheezing. Although COPD may be suspected based on findings from a history and physical examination, the diagnosis must be confirmed by spirometry to detect airflow obstruction and its severity [9]. In symptomatic patients, spirometry is helpful for determining whether symptoms are due to respiratory disease or other conditions [19]. Therefore, screening adults in primary care using validated prescreening questionnaire (COPD Diagnostic Questionnaire (CDQ) or COPD Assessment Test, clinical examination, and screening/ mobile spirometry (without bronchodilation) could identify those with probable COPD and warrant diagnostic follow-up pulmonary function testing [20].

Measures of pulmonary function/spirometry are compared against age, sex and racial norms to gauge the severity of COPD [13]. Upon identification of airflow obstruction FEV1/FVC <70 (70%), patients are staged by degree of airflow limitation. The status quo is to gauge airflow pulmonary limitations are predominately based upon Forced Expiratory Volume in 1 second (FEV1), the predominate marker of airflow limitation. Patients can be placed into four stages (I, II, III, or IV) based upon FEV1 (Gold Stage 1=FEV 1≥80%-50% predicted; Gold Stage 2=FEV 1 50% or <80% predicted; Gold Stage 3= FEV 150%-30% predicted; Gold Stage 4=FEV 1<30% predicted) [13]. Since 2011, the GOLD Strategy developed clinical staging (named as A, B, C, or D) in addition to pulmonary function staging-this is based upon symptoms assessment (using dyspnea scale or COPD Assessment Test [CAT] score), as well as exacerbation history [13]. These two staging systems are recommended to be used in conjunction in regimen prescription. Likewise, current treatment recommendations proposed by the GOLD Strategy (2019) suggest a treatment regimen for the various COPD phenotypes, addressing the complexity of COPD. Early screening will enable identifying missed COPD patients in early Gold Stage 1 or A [13].

Importance of Screening for COPD

Screening is only justified if there is evidence of under diagnosis and evidence of clinical and economic benefits from early diagnosis. There continues to be under-diagnosis of COPD for a variety of reasons. Often smokers with early disease and only mild airflow limitation have few symptoms or poor perception of their symptoms such as cough, dyspnea, and sputum as a normal consequence of smoking. According to GOLD (2019), a diagnosis of COPD should be considered in any patient who has dyspnea, chronic cough or sputum production, and a history of exposure to risk factors [13]. Studies have shown clearly that patients with undiagnosed GOLD stage 1 COPD will have signs of impaired quality of life and reduction

in activities of daily living [21,22]. In an international study among 30,874 participants with a mean age of 56 years, 81.4% of COPD cases were undiagnosed (as defined by spirometry), with the highest rate of undiagnosed cases in Nigeria (98.3%) and the lowest rate in Lexington, Kentucky (50.0%) [23]. Multivariate analysis indicated a greater probability of under diagnosis of COPD associated with male sex, younger age, never and current smoker, lower education, and no previous spirometry [23].

Underuse or unavailability of spirometry in primary care settings is one of the most important factors causing under diagnoses of COPD [24]. In addition, the maintenance of such devices, and the handling and interpretation of results by non-expert personnel are critical limitations [14]. Although, PFT has been shown to be a predictor of cardiorespiratory morbidity and mortality, it is generally not part of routine health screening strategies in the general population and among high risk individuals with CVD. Several portable devices have been validated that allow for the rapid collection of spirometric parameters, making them especially useful in the screening of respiratory diseases in non-specialized, primary care areas [25,26]. The ability to perform spirometry - an essential test for COPD diagnosis - in primary care centers would improve early screening for COPD; furthermore, classification of patients as low or high risk may offer valuable planning options for early treatment. In a large retrospective study among adults who were followed in a primary care clinic, researchers identified missed opportunities for diagnosis in 32,900 (85%) of the patients in the 5 years immediately preceding the diagnosis of COPD and (58%) of 22, 286 in the 6-10 years before diagnosis [27]. This missed diagnosis could be improved by case-finding in patients with concordant long-term comorbidities such as high-risk CVD patients.

Conclusion

Experts suggest that we should identify early disease, but current guidelines favor targeted case-finding rather than population screening. The addition of a systematic case-finding approach may be more effective in identifying undiagnosed clinically significant COPD cases in high risk CVD patients. Screening for COPD symptoms that patients may not themselves perceive is very important in primary care, with subsequent spirometry defining the diagnosis. Therefore, early screening and testing could be extended to primary care settings in which there are health professionals with basic training in performing respiratory function tests, and easily accessible to the general public. Since, effective management strategies are available for COPD, spirometry can help in the diagnosis of COPD at a stage when treatment will lead to better outcomes and improved quality of life. Performing spirometry, even on a truly asymptomatic patient, may allow earlier diagnosis and modification of risk factors such as smoking (mostly) and better management of comorbid conditions.

What this Paper Adds to the Clinical Practice of Nursing

- Early screening for COPD may provide a venue to health education and risk modification.

- At risk patients may be identified at an early stage to halt the progression with early disease management.

References

1. Ford ES, Mannino DM, Wheaton AG, Giles WH, Presley-Cantrell L, Croft JB. Trends in the prevalence of obstructive and restrictive lung function among adults in the United States: findings from the National Health and Nutrition Examination surveys from 1988-1994 to 2007-2010. Chest. 2013; 143: 1395-1406.
2. Martinez CH, Mannino DM, Jaimes FA, Curtis JL, Han MK, Hnsal NN, et al. Undiagnosed Obstructive Lung Disease in the United States. Associated Factors and Long-term Mortality. Ann Am Thorac Soc. 2015; 12: 1788-1795.
3. WHO. Burden of COPD. 2017.
4. Anzueto A, Miravitlles M. Pathophysiology of dyspnea in COPD. Postgrad Med. 2017; 129: 366-374.
5. Chen W, Thomas J, Sadatsafavi M, FitzGerald JM. Risk of cardiovascular comorbidity in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. Lancet Respir Med. 2015; 3: 631-639.
6. Navarro A, Lapuente AM, Pareja J, Barrer A, Yun S, Sierra ADL, et al. Prevalence and underdiagnosis of COPD in patients with ischemic heart disease demonstrated by coronary angiography. Prognostic implications. European Respiratory Journal. 2015; 46: 487.
7. Rabe KF, Hurst JR, Suissa S. Cardiovascular disease and COPD: dangerous liaisons? Eur Respir Rev. 2018; 27: 180057.
8. Lee H, Jhun BW, Cho J, Yoo KH, Lee JH, Kim DK, et al. Different impacts of respiratory symptoms and comorbidities on COPD-specific health-related quality of life by COPD severity. Int J Chron Obstruct Pulmon Dis. 2017; 12: 3301-3310.
9. Christensen CH, Rostron B, Cosgrove C, Altekruse SF, Hartman M, Gibson JT, et al. Association of Cigarette, Cigar, and Pipe Use With Mortality Risk in the US Population. JAMA Intern Med. 2018; 178: 469-476.
10. Huiart L, Ernst P, Suissa S. Cardiovascular morbidity and mortality in COPD. Chest. 2005; 128: 2640-2646.
11. Vanfleteren L, Spruit MA, Wouters EFM, Franssen FME. Management of chronic obstructive pulmonary disease beyond the lungs. Lancet Respir Med. 2016; 4: 911-924.
12. Guirguis-Blake JM, Senger CA, Webber EM, Mularski RA, Whitlock EP. Screening for Chronic Obstructive Pulmonary Disease: Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA. 2016; 315: 1378-1393.
13. GOLD. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease. Global Initiative for Chronic Obstructive Pulmonary Disease. 2019.
14. Tinkelman DG, Price D, Nordyke RJ, Halbert RJ. COPD screening efforts in primary care: what is the yield? Prim Care Respir J. 2007; 16: 41-48.
15. Zhou P, Yang L, Huang YX. A Smart Phone Based Handheld Wireless Spirometer with Functions and Precision Comparable to Laboratory Spirometers. Sensors. 2019; 19: 2487.
16. Ho T, Cusack RP, Chaudhary N, Satia I, Kurmi OP. Under- and over-diagnosis of COPD: a global perspective. Breathe (Sheff). 2019; 15: 24-35.
17. Haroon S, Jordan R, O'Beirne-Elliman J, Adab P. The Case Finding Yield For COPD In Primary Care: A Systematic Review And Meta-Analysis. American Journal of Respiratory and Critical Care Medicine. 2014; 189: A2956.
18. Enocson A, Jolly K, Jordan RE, Fitzmaurice DA, Greenfield SM, Adab P. Case-finding for COPD in primary care: a qualitative study of patients' perspectives. Int J Chron Obstruct Pulmon Dis. 2018; 13: 1623-1632.
19. Qaseem A, Wilt TJ, Weinberger SE, Hanania NA, Criner G, Molen T, et al. Diagnosis and management of stable chronic obstructive pulmonary disease: a clinical practice guideline update from the American College of Physicians, American College of Chest Physicians, American Thoracic Society, and European Respiratory Society. Ann Intern Med. 2011; 155: 179-191.

20. Celedon JC, Roman J, Schraufnagel DE, Thomas A, Samet J. Respiratory health equality in the United States. The American thoracic society perspective. Ann Am Thorac Soc. 2014; 11: 473-479.

21. Miravitlles M, Soriano JB, Garcia-Rio F, Munoz L, Duran Tauleria E, Sanchez G, et al. Prevalence of COPD in Spain: impact of undiagnosed COPD on quality of life and daily life activities. Thorax. 2009; 64: 863-868.

22. Franssen FME, Smid DE, Deeg DJH, Huisman M, Poppelaars J, Wouters EFM, et al. The physical, mental, and social impact of COPD in a population-based sample: results from the Longitudinal Aging Study Amsterdam. NPJ Prim Care Respir Med. 2018; 28: 30.

23. Lamprecht B, Soriano JB, Studnicka M, Kaiser B, Vanfleteren LE, Gnatiuc L, et al. Determinants of underdiagnosis of COPD in national and international surveys. Chest. 2015; 148: 971-985.

24. Osterweil N. COPD: Clinicians Miss Myriad Chances to Spot It Early. Medscape. 2014.

25. Du Plessis E, Swart F, Maree D, Heerden JV, Esterhuizen TM, Irusen EM, et al. The utility of hand-held mobile spirometer technology in a resource-constrained setting. S Afr Med J. 2019; 109: 219-222.

26. Ramos Hernandez C, Nunez Fernandez M, Pallares Sanmartin A, Roibas CM, Dominguez LC, Ril MIB, et al. Validation of the portable Air-Smart Spirometer. PLoS One. 2018; 13: e0192789.

27. Jones RC, Price D, Ryan D, Sims EJ, von Ziegenweidt J, Mascarenhas L, et al. Opportunities to diagnose chronic obstructive pulmonary disease in routine care in the UK: a retrospective study of a clinical cohort. Lancet Respir Med. 2014; 2: 267-276.