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REVIEW ARTICLE

Diagnosis of chronic obstructive pulmonary disease in the primary care setting

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Abstract

Chronic obstructive pulmonary disease (COPD) remains a major cause of morbidity and mortality with increasing rates during the last decades. Due to the progressive nature of the disease, underestimation of symptoms by the patients, lack of knowledge and underuse of spirometry by the Primary Care providers the disease remains under-diagnosed in about half of the cases.

Patients with a smoking history of ≥20 pack-years and relevant symptoms (e.g. dyspnea, chronic cough and sputum production) are considered a high risk group. Measurement of spirometric parameters after administration of a short acting bronchodilator confirms the presence of irreversible airflow obstruction and establishes the diagnosis. However in the primary care spirometry is usually not available and differential diagnosis with other obstructive pulmonary diseases (e.g. asthma, bronchiectasis) is not always easy. General Practitioners (GPs) need simple screening tools to decide if a patient belong to a high risk group and pulmonary consultation is necessary. Early and accurate diagnosis of COPD in the primary care setting allowing for a timely and effective management which reduces the rate of decline in lung function improves survival of patients, their quality of life and reduces health-care utilization.

The aim of the present review is to provide the existing information about COPD diagnosis and the related problems in the Primary Care. Also we reviewed numerous simple COPD diagnosis questionnaires as well as the use of hand-held flow meters which could be used as effective screening tools. Hippokratia. 2012; 16 (1): 17-22

Key words: chronic obstructive pulmonary disease, primary care, diagnosis, questionnaires, spirometry, case-identification, review

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Chronic Obstructive Lung Disease (COPD) is a preventable and treatable disease that characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to cigarette smoke and other noxious particles or gases[1]. Prevalence of clinically significant COPD (GOLD stage II or higher) is estimated to be 10.1% according to the results of an international population-based investigation[2]. It was estimated that 1 every 4 men and 1 every 6 women without COPD at the age of 55 years will eventually develop COPD at some time during their further life[3].

Prevalence rates of COPD are expected to increase in next decades, notably among women and in developing countries populations[4]. By 2030, COPD is expected to become the third leading cause of death in middle-income countries[5]. Trends in age-standardized death rates for the 6 leading causes of death in the USA from 1970 through 2002 indicates that, while mortality from several these chronic conditions decline over the period, COPD mortality increased[6]. In the European Union (EU) the total direct cost of respiratory diseases is estimated to be about 6% of the total health care budget, with COPD accounting for over 50% (38,6 billion Euros)[7]. The majority of this cost is attributed to hospitalizations for exacerbations[8].

Patients with COPD face a significantly increased risk for premature death[9]. COPD exacerbations influence mortality, pulmonary function, physical activity and quality of life of patients[10-12]. Physical activity in COPD patients is lower than that observed in healthy subjects of similar age[13], and is reduced even in stable GOLD stage II patients[14]. Patients with more advanced stages are also at increased risk for comorbid conditions (e.g. diabetes, arterial hypertension, cardiovascular disease, osteoporosis, lung cancer, and depression) as well as associated systemic consequences (e.g. weight loss and muscle dysfunction due to inactivity and deconditioning) which play an important prognostic role[15-17].

Smoking cessation is the only effective way to change the natural history of the disease and to oppose the deleterious effects of smoking on lung function[18].

Underdiagnosis of COPD in the primary care setting

COPD underdiagnosis has been observed in many studies throughout the world. In a large epidemiologic, multicenter, population-based study conducted in Spain, a total of 4,035 men and women (40 to 69 years) who were randomly selected from a target population of 236,412 subjects, had answered a relevant questionnaire and underwent spirometry. The prevalence of COPD was 9.1%, 15% in smokers, 12.8% in ex-smokers, and 4.1% in

nonsmokers. There was no previous diagnosis of COPD in 78.2% of cases. Multivariate analysis showed that individuals had a higher probability of having received a previous diagnosis of COPD if they lived in urban areas, were of male gender, were >60 years old, had higher educational levels, had >15 pack-year smoking history, or had symptoms of chronic bronchitis[19]. During 2000, an estimated 10 million U.S. adults reported physician-diagnosed COPD. However, data from NHANES III estimate that approximately 24 million U.S. adults have evidence of impaired lung function, indicating that COPD is underdiagnosed[20].

COPD underdiagnosis could be attributed to underestimation of symptoms by the patients. In a large International Survey aimed to quantify morbidity and burden in COPD, 36% of the patients with dyspnea during basic everyday activities described the disease as mild or moderate[21].

Chronic obstructive lung diseases (e.g. asthma and COPD) are common among the target-population of a GP. In the Netherlands, for example, an average GP will encounter annually eight new cases of asthma and seven of COPD, while managing 50 patients with asthma and 60 with COPD[22]. Despite this increased burden of respiratory patients, spirometry remains largely underused in the primary care[23,24]. This problem has been repeatedly observed even in countries with advanced health care systems. It has been observed in Italy[25], but also for diagnosis and treatment of patients in Spain, where only one third of patients with COPD had post-bronchodilator spirometry while about half of them had not undergone spirometry at all[26]. In the USA a recent epidemiological survey, among more than 1.5 million members of insurance organizations, showed that only 32% of patients with a new COPD diagnosis had undergone spirometry the previous 2 years to 6 months following diagnosis[27].

The limited use of spirometry within primary care has been attributed to cost constraints, lack of access and time, low quality of examinations, inaccurate interpretation of results, and inadequately trained staff[24,28,29]. Furthermore, evidence suggests that drugs are frequently prescribed inappropriately and not according to recommendations based on spirometric disease severity[26,30]. After publication of the results of a large randomized controlled trial conducted in Italy, which failed to prove a significant advantage of office spirometry in improving the diagnosis of asthma and COPD in general practice[31], Enright argued against its use for COPD screening by primary care physicians[32]. A recent study from Australia[33] showed that establishing spirometry into general use is difficult but repeated training courses, review of the results by specialists and feedback regarding the quality of the manoeuvres could improve and maintain competency and minimize error rates.

Taking into account that the cost of COPD treatment is constantly increasing while health-related budget is continuously declining, the need for accurate diagnosis is imperative. All patients who are suspected to have COPD based on history and clinical examination should undergo official spirometry after bronchodilation by respiratory specialists to minimize overdiagnosis and overtreatment, a rather common situation in the primary care setting[34].

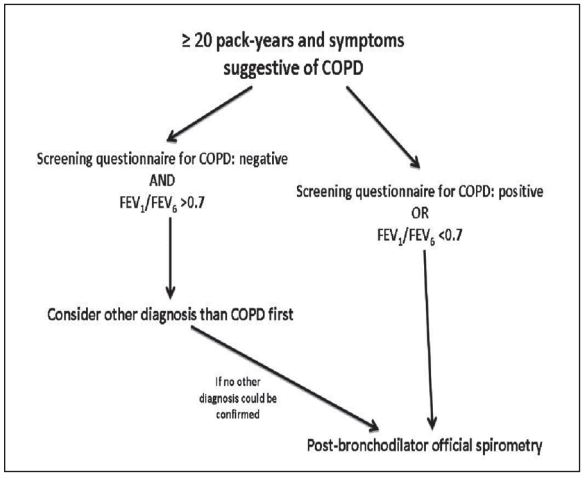

Figure 1: A suggested diagnostic algorithm for COPD in the Primary Care Setting.

Evaluating medical history, risk factors, clinical examination and using validated questionnaires

Even though performing high-quality spirometry in the primary care setting and evaluating the results correctly is a matter of debate, taking a detailed medical history, using validated questionnaires and identifying common comorbidities is an effective initial approach for screening subjects who visit a GP. Diagnosis and management of COPD should always be based on post-bronchodilator official spirometry.

The most common respiratory related symptoms of COPD are dyspnea, chronic cough, sputum production, chest tightness and wheezing[1]. All these symptoms are usually progressive and persistent over time while the adoption of a sedentary way of living may mask breathlessness. Taking into account that symptoms are nonspecific, a GP should always ask about the characteristics of chronic cough in order to reveal other causes (Table 1), other medical conditions that may explain dyspnea (Table 2) or chronic sputum production (e.g. bronchiectasis). Weight loss, reduction in free-fat mass and anxiety are common problems in more advanced stages of the disease and are important prognostic factors[35,36]. However they might be symptoms of other diseases (e.g. tuberculosis, bronchial cancer) and therefore should always be considered in the differential diagnosis.

We should emphasize that the presence of symptoms is important. Even in the mild stage of the disease, symptomatic patients had a faster decline in lung function, increased respiratory care utilization and lower quality of life than asymptomatic subjects[37]. Additionally there are no prospective studies or guidelines recommendations that asymptomatic subjects with mild to moderate airflow

Table 1: Causes of chronic cough with normal chest X-ray.

Intrathoracic
▪ COPD
▪ Bronchial asthma
▪ Central bronchial carcinoma
▪ Endobronchial tuberculosis
▪ Foreign body
▪ Bronchiectasis
▪ Diastolic left heart failure
▪ Diffuse interstitial lung disease (early stage)
▪ Cystic fibrosis
Extrathoracic
▪ Upper airways cough syndrome
▪ Gastroesophageal reflux disease
▪ Drugs (e.g. ACE inhibitors)

obstruction would experience additional health benefits if labelled and treated as having COPD[38,39]. Even though smoking cessation is strongly recommended for every smoker[40], incorporating spirometry into an anti-smoking programme as a motivational tool is not always increase cessation rates[41,42].

GPs should ask in details and quantify smoking habits (pack-years= cigarettes consumed per day X years with regular smoking / 20) as history of cigarette smoking is considered the most important causative factor for the development of COPD[1]. Long-term cohort studies proved that current smokers had a greater annual rate of decline in FEV_1 compared to never smokers[18,43]. In a recent study among 3,955 subjects screened for a work-related medical evaluation, quantitative smoking history (≥ 20 pack-years) showed the highest odds ratio for association with COPD and was significantly greater than those for any one of the four respiratory symptoms evaluated[44]. It was also proved the low positive predicted value of respiratory symptoms for airways obstruction.

Table 2: Common causes of chronic dyspnea

▪ COPD
▪ Left ventricular failure
▪ Bronchial asthma
▪ Diffuse interstitial lung disease
▪ Pleural effusion
▪ Pulmonary thromboembolic disease
▪ Pulmonary arterial hypertension
▪ Postintubation tracheal stenosis
▪ Neuromuscular disease
▪ Anemia, severe
▪ Psychogenic dyspnea

Although cigarette smoking is widely acknowledged as the single most important risk factor for COPD, it is now recognized that never smokers may account for between one-fourth and one-third of all COPD cases[45]. Even though never smokers were less likely to have COPD and had less severe COPD than ever smokers, they comprised 23.3% of those classified with GOLD stage ≥II COPD in the BOLD study[46]. Predictors of COPD in never smokers include advanced age, low educational level, occupational exposure, prior physician-diagnosed asthma, childhood respiratory diseases, BMI alterations and exposure to biomass smoke (use for cooking/heating)[46-48].

There are well-validated questionnaires for following-up patients with established diagnosis of COPD[49-51] which are related to severity of airway obstruction and prognosis. On the other hand there is no widespread use of screening questionnaires in the primary care. There are some simple, self-scored, symptom-based questionnaires which could identify high risk subjects for COPD in a general practice setting[52-54]. A common characteristic of these questionnaires are their high negative predictive value while positive predictive value reaches 50% be-

Table 3: Several screening questionnaires for COPD and their properties

	Cut-off point	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Price et al[52]	≥16.5	58.7	77	37	89
Price et al[52]	≥19.5	80.4	57.5	30.3	92.7
Martinez et al[53]	≥5	84.4	60.7	56.8	86.4
Ohar et al[44]	≥1 symptom	90	22	40	80
Ohar et al[44]	≥20 pack-years	88	34	43	83
Hanania et al[54]	≤18	82.6	47.8	26.5	92.3

cause the majority of current smokers without airflow obstruction share the same symptoms with COPD patients (Table 3). This means that a subject with negative score in such a questionnaire probably does not suffer from COPD and an alternative diagnosis should be considered to explain his/her symptoms. If someone had a positive score in a COPD screening questionnaire then official spirometry after bronchodilator and pulmonary consultation are necessary. We should be very careful when we choose a screening questionnaire because external validation may not confirm the results of the original one[55].

Official spirometry and portable hand-held spirometers

Spirometry is the best standardized, most reproducible and most objective measurement of airflow limitation[1]. It is needed to make a confident diagnosis of irreversible airways obstruction (postbronchodilator $FEV_1/FVC<0.7$ according to GOLD guidelines[1] or postbronchodilator $FEV_1/VC<$lower limit of normal according to ATS/ERS guidelines for spirometry[56]) and exclude other diagnoses that may present with similar spirometric patterns (e.g. severe asthma, bronchiectasis, obliterative bronchiolitis). Spirometric severity of the disease is defined according to postbronchodilator FEV_1 % pred. (stage I: FEV1≥80%, stage II: 50≤FEV1<80%, stage III: 30≤FEV1<50% and stage IV: FEV1<30%). The two main problems of establishing spirometry in the primary care setting, excluding cost and lack of time during every-day clinical practice, are spirometry performance and evaluation of the results.

Achieving ATS/ERS quality standards for spirometry tests[57] depends mainly on training and experience of the examiner (e.g. physician, pulmonary function technologist, staff of primary care practitioners) as well as the cooperation with the patient. Many international organizations have developed educational courses and certification for health care professionals who perform spirometry[58,59]. As only about half of the spirometry tests in primary care meet the quality goals[60], a programme of continuous review and feedback regarding the quality and interpretation of tests, in cooperation with pulmonary specialists, is necessary to improve and maintain competency[61].

GOLD guidelines proposed the fixed 0.7 post-bronchodilator FEV_1/FVC cut-off point for the diagnosis of the disease and four stages according to FEV_1 % predicted, a definition that leads to overdiagnosis of the disease especially among the elderly[62] as there is an age-related decline in FEV_1/FVC ratio[63]. In a study among 14,056 symptomatic adults referred for spirometry by their general practitioner, the percentage of false positive diagnoses using the fixed cut-off point definition were 33.2% for the subgroup 61–70 years and 38.7% for those aged 71–80 years compared to definition according to lower limit of normal. Moreover in the subgroup of current or ex-smokers aged ≥50 years positive predictive value of pre-bronchodilator airflow obstruction was 84.2% compared to the post- bronchodilator definition[64]. A practical approach is using only GOLD stages ≥II for establishing COPD diagnosis among the elderly[65].

Another option for the primary care physicians with no direct approach to official spirometry is to use simple, hand-held, expiratory flow-meters that measure FEV_1/FEV_6 ratio as FEV_6 could be used as a good alternative for FVC[66]. In a study among 204 undiagnosed current and former smokers >50 year old, the pre-bronchodilator FEV_1/FEV_6 cut-off point of 0.75 showed a positive predictive value of 52% and negative predictive value of 91% for COPD case-finding[67]. In another study among 1,078 subjects >40 year old who visited a GP (current smokers: 48.4%), the combination of positive IPAG questionnaire (≥17 points) plus post-bronchodilation FEV_1/FEV_6 <0.7 showed a positive predictive value of 71% and negative predictive value of 97% for COPD case-finding[68].

A simplified diagnostic algorithm of COPD in the primary care setting is proposed in figure 1 taking into account that we are far from establishing a spirometer in every GD site and spirometry has not been proven to be cost-effective as a screening tool for every asymptomatic smoker. Based on the high negative predictive value of both COPD screening questionnaires and FEV_1/FEV_6 measurements[52-54,67,68] we believe that a negative combination could be used to exclude COPD diagnosis. On the other hand their positive predictive value is >50% in most studies so we proposed that if either of them is positive then official spirometry is recommended. We propose using pre- or post-bronchodilator FEV_1/FEV_6[67,68].

It is important for a GP, who is involved in COPD management, to understand that COPD diagnosis is the result of a holistic decision-making strategy that takes into account medical history, risk factors, physical examination, spirometry, radiographic examinations and long-term response to inhaled bronchodilators and/or corticosteroids. A normal spirometry a few weeks/months after treatment confirms the diagnosis of bronchial asthma meanwhile some patients demonstrate characteristics of both diseases and spirometry alone, even with reversibility test, is not enough to establish a clear diagnosis.

All authors have no conflicts of interest to declare.

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