

What Factors Influence an Early COPD Diagnosis [in Primary Care]?

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Abstract

Background: There are millions of people living with COPD who have not been diagnosed. Patients have regularly lost half of their lung function by the point of diagnosis, and therefore there are little interventions available.

Aim: The aim of this systematic literature review, was to identify factors influencing late- and under-diagnosis of COPD within primary care. This includes considering the current methods of COPD screening, and whether an early-screening would benefit diagnostic rates.

Methods: A comprehensive, systematic literature search was undertaken using the following databases: BNI, CINAHL, Medline, NHS Evidence, PubMed, ScienceDirect, Wiley Online. Following this, a critical review of literature was performed on ten relevant articles. A thematic analysis followed.

Results: There is a significant lack of up-to-date research on COPD screening and early detection. Generalised screening versus case-finding may be a method of identifying the undiagnosed population, however, evidence needs to improve. There is a lack of COPD education in healthcare and wider society. COPD amongst women is on the rise, yet they are less likely to be identified for COPD.

Conclusion: The responsibility of increased diagnoses does not only lie with nurses, but with organisations. There is a necessity for up-to-date guidance and research to be provided. Screening is likely to be the future preferred method for identifying those undiagnosed, but research needs to identify the benefits of screening versus case-finding.

Relevance: The findings can be applied to primary care nursing, to combat COPD underdiagnoses.

Key Points

- Early detection of COPD reduces mortality rates, and improves quality of life
- Early detection can be achieved through generalised screening, but research needs to be undertaken to compare generalised screening with case-finding approaches
- Education and nurse training must improve
- Microspirometry must only be used as a precursor tool, and spirometry for diagnosis
- Women are the at-risk population
- There is a call for updated clinical guidelines regarding COPD screening

MeSH Key Words

Early Diagnosis
Diagnosis
Primary Health Care
Pulmonary Disease, Chronic Obstructive

Introduction

Chronic Obstructive Pulmonary Disease is commonly late, and/or under-diagnosed, particularly in the five years preceding diagnosis (NICE, 2016; Jones et al, 2014). COPD progression rates can be reduced and symptoms can be improved by early detection, as there are more management options available. Furthermore, early detection improves mortality and morbidity rates (Csikesz and Gartman, 2014), and improves patient outcomes (Garvey, 2016). In addition, patients can maintain a considerable quality of life for longer (National Institute for Health and Care Excellence (NICE), 2016). The interventions available for mild COPD following early diagnosis would save the NHS £1 billion over ten years (Department of Health (DoH), 2010). COPD screening using questionnaires and diagnostic spirometry, is achievable in primary care, and costs are deemed manageable (Dirven et al, 2013). In addition, the cost of treatment for COPD further down the line is significantly greater. A study showed that COPD diagnosis two years earlier would have saved SEK 15 billion (≈£1.37 billion) in healthcare costs for 600,000 patients (Larsson et al, 2016). Despite this, COPD is regularly underdiagnosed. Nurses play a pivotal role in the influence of the disease through early detection, accurate diagnosis, monitoring the disease progression, evidence-based treatment, and even prevention (Garvey, 2016).

Background

Chronic Obstructive Pulmonary Disease (COPD) is an incurable long-term condition (Department of Health (DoH), 2015). NICE (2011) suggests screening those aged 35 years and above, who are (ex)smokers, and have a chronic cough. This is known as case-finding, as it selects patients only who have certain symptoms and risk factors. However, patients are commonly missed using this method, as patients may be symptomless with mild-moderate

COPD (Kathirvel Senthilnathan et al, 2016). It is imperative to consider early detection as later down the line, patients have a reduced access to treatments, and smoking cessation makes considerably less of an impact upon lung function decline; this is likely due to the speed of lung decline following a sigmoid pattern through GOLD stages II and III before reaching advanced stages (Csikesz and Gartman, 2014).

Within the field of respiratory medicine, there remains controversy regarding the population that should be screened for COPD (GOLD, 2017). Some argue that the screening of asymptomatic patients shows no benefit (Siu et al, 2016), particularly in those not exposed to risk factors (GOLD, 2017). These contend only screening symptomatic smokers or those exposed to risk factors (López Varela, 2016). On the other hand, other studies support screening asymptomatic smokers (Barthwal and Singh, 2014), or the general population (Nelson et al, 2012). Therefore, questions arise regarding screening itself. The current practice is active case-finding, not screening (GOLD, 2017), as case-finding in primary care is a practicable option in terms of resources, for early COPD detection (López Varela, 2016). But is this method responsible for the missing millions?

Aims

The aim of this systematic literature review, is to identify why COPD is late- and under-diagnosed within primary care. This includes, comparing the benefits of case-finding versus general screening for COPD, and to ascertain if the two methods affect rates of COPD diagnosis. In addition, the role of the nurse in early COPD diagnosis in primary care will be considered.

Methodology

Studies pertaining to COPD screening in primary care were sought. The following databases were used: BNI, CINAHL, Medline, NHS Evidence, PubMed, ScienceDirect, Wiley Online. The

search was undertaken using keywords and Boolean expressions (Smith and Noble, 2015). Derivatives of the following search terms were used: “chronic obstructive pulmonary disease”; “screen*”; “nurs*”.

Inclusion Criteria: Articles published within the past five years; free to access; peer-reviewed journal articles; published within the past five years; written in English; similar healthcare system to the UK; primary source. Results were further limited by hand-searching, omitting any articles less relevant to the topic. Following this, the most pertinent articles were selected, and the reference lists were investigated; selecting any applicable articles that met the inclusion criteria. This is known as snowball sampling: the selection of participants from earlier participants (Polit and Beck, 2017). A total of ten articles were selected. Following this, a systematic review of literature was undertaken. Caldwell et al’s (2011) critiquing framework was employed for all quantitative and qualitative articles. For mixed methods studies, MacInnes’s (2009) framework was utilised. Following this, the studies underwent a thematic analysis using a meta-matrix, to enable themes and patterns across the study to be identified (Polit and Beck, 2017).

Results

The Influence of Gender upon Diagnosis

Chronic Obstructive Pulmonary Disease among women is on the rise (Csikesz and Gartman, 2014; Aryal, Diaz and Mannino, 2014), and has now equalised between the genders (GOLD, 2017 cite Landis et al, 2014; Wisnivesky et al, 2014). This is likely due to the increased prevalence of smoking among women (GOLD, 2017; Office for National Statistics, 2017; Delgado et al, 2016; Forey et al, 2011; Schirnhofner et al, 2007), or exposure to other risk factors, such as indoor pollution (GOLD, 2017; Schirnhofner et al, 2007). Other explanations could be women working in customarily male roles (Aryal, Diaz and Mannino, 2014), or due to physiological susceptibilities, such as increased airway hyperresponsiveness (GOLD, 2017 cite Foreman et al, 2011; Blair and Evelo, 2013) and faster lung decline (Blair and Evelo, 2013 cite Verhage et al, 2011).

Other evidence suggests that rising rates of COPD in women are likely to be a result of women's greater incline to seek medical advice (Malmusi et al, 2014) and to partake in screening (Kotaki et al, 2017; Delgado et al, 2016; Weiss et al, 2014; Estes et al, 2014; Menezes et al, 2005). Traditional gender roles saw men as the 'stronger' character. A study has showed that these stereotypes exist today in healthcare, with men more likely to be in denial about their diagnosis ($p < 0.01$) due their assigned 'strong' gender role (Modica et al, 2014). Therefore, the participation rates of women in studies are often higher, which may result in a gender bias (Kotaki et al, 2017). On the other hand, women were found to be taken less seriously for signs of COPD, and labelled with psychosomatic symptoms, even when the severity of COPD between the two sexes was equal (Delgado et al, 2016). Men were more likely to be suspected of COPD by Family Practitioners (FPs), with women frequently receiving less therapeutic efforts, and male FPs referring male patients to specialists (Delgado et al, 2016). Therefore, gender inequality also exists among professionals, which affects the decision-making process. In a study of clinical practice, men were more likely to have suspected COPD (Roberts, Patel and Partridge, 2016), suggesting that women are more frequently underdiagnosed than men.

The Obligation of Screening for Early Diagnosis

The identification of COPD in healthcare remains at the centre of debate. Some studies support screening for COPD in the general population (Kotaki et al, 2017; Dirven et al, 2013; Sansores et al, 2013), or those who are asymptomatic smokers (Wisnivesky et al, 2014; Buist et al, 2005). Screening poses many benefits, out of those who are caught later, 50% of patients found to have COPD had no previous diagnosis, and by this point, there are very few interventions available (Wisnivesky et al, 2014). By the time patients are diagnosed with COPD, their FEV1 < 50% predicted (Blair and Evelo, 2013), meaning the patients have moderate to severe COPD (GOLD, 2017). UK national guidelines assert that COPD needs to be diagnosed early and accurately (Gruffydd-Jones et al, 2015). Wisnivesky et al (2014) support the screening of asymptomatic smokers, stating that it may identify those in the earlier stages of COPD, who remain undiagnosed. In addition, the authors state that asymptomatic patients can have moderate COPD, and patients caught earlier are more likely

to quit smoking. This is likely to be due to the 'hope' of slowed progression rate of COPD (Bragadottir et al, 2017).

Others support case-finding only, where patients are screened for COPD based upon symptoms and risk factors (GOLD, 2017; López Varela et al, 2016; Estes et al, 2014; Weiss et al, 2014; Buist et al, 2005). NICE (2011) argue that case-finding is the most cost-effective method. Moreover, generalised screening generates a vast increase in workload that professionals may be unable to handle (Haroon et al, 2015). Staff and funding are often barriers to screening in primary care (Kotaki et al, 2017; Estes et al, 2014). Furthermore, pharmacological treatment has a poor impact on early COPD (Celli et al, 2015; NICE, 2011). In addition, asymptomatic individuals with COPD GOLD Grade I may not have a lower lung function than asymptomatic individuals without COPD (Celli et al, 2015 cite Bridevaux et al, 2008).

Sansores et al (2013) produced a pioneering study that compared the generalised screening of smokers against a case-finding cohort. The findings showed that undiagnosed COPD was far more prevalent in the screening group (13.3% vs. 10.1%). The authors state that despite GOLD (2011) guidelines, screening with spirometry may be useful for detecting smokers with COPD; particularly so in women who are more susceptible to the effects of smoking, and have a faster decline in lung function (Delgado et al, 2016). Furthermore, the PLATINO study discovered that underdiagnoses was more common in asymptomatic than symptomatic smokers (Menezes et al, 2005). However, in 2017 following these studies, GOLD asserted that no studies had produced relevant findings on the benefits of screening asymptomatic individuals, citing the BOLD study, which is now significantly outdated (Buist et al, 2005).

Confusion Regarding Diagnostic Tools

Perhaps underdiagnoses arise from the methods of screening itself, rather than the population screened. Confusion exists among the tools utilised: The recommended screening methods for COPD include the use of medical examinations with questionnaires (Estes et al, 2017; López Varela, 2016; Siu et al, 2016), to identify relevant risk factors, followed by imperative diagnostic spirometry (GOLD, 2017; Kotaki et al, 2017; Delgado et al,

2016; López Varela et al, 2016; Roberts, Patel and Partridge, 2016; Celli et al, 2015; Weiss et al, 2014; Buist et al, 2007; Levy et al, 2006 cites GOLD, 2001; Menezes et al, 2005).

Microspirometry with questionnaires may also be utilised as a precursor method for spirometry, as both are accessible in primary care settings, without the necessity of spirometers (Celli et al, 2015); and are affordable (Dirven et al, 2013; Sichletidis et al, 2011). Others promote using peak flow meters (Nelson et al, 2012). Limited access to diagnostic tools is often a barrier to diagnosis (Haroon et al, 2015), in addition to cost, time and lack of training (Spyratos, Chloros and Sichletidis, 2012). It is integral that nurses know that microspirometers must not be used to diagnose COPD, as they result in false diagnoses (GOLD, 2017; Gaduzo et al, 2015; NICE, 2011). In addition to precursor tools, nurses must undertake a history taking and physical assessment, prior to diagnostic testing (Bragadottir et al, 2017; GOLD, 2017; Celli et al, 2015; Roberts, Patel and Partridge, 2016).

Studies were found incorrectly using hand-held microspirometry to confirm COPD diagnosis (Estes et al, 2014). This is not advised in practice, as microspirometers such as the Piko-6® often cause an over-estimation of COPD prevalence, and are consequently employed as an accurate, sensitive precursor tool, not a diagnostic tool (Frith et al, 2011). In addition, low-quality diagnostic spirometry can have adverse effects, causing the false positive diagnosis of COPD in patients, which leads to unnecessary and harmful treatments, and increased healthcare costs (Weiss et al, 2014). Furthermore, as healthcare funds are plummeting, and COPD treatment expenses are rising, precise diagnosis is imperious (Spyratos, Chloros and Sichletidis, 2012). Therefore, high-quality diagnostic spirometry is fundamental in primary care screening.

Correctly Defining Airway Obstruction < can get rid if needs be!!

Guidelines recommend that three reproducible spirometry readings must be produced (van den Bemt et al, 2014), and must meet relevant criterion guidelines (Kotaki et al, 2017; Roberts, Patel and Partridge, 2016; Celli et al, 2015; Sansores et al, 2013; Levy et al, 2010), by well-trained staff (Spyratos, Chloros and Sichletidis, 2012). In addition, relevant literature states that 400µg of albuterol or salbutamol is the recommended dose for post-bronchodilator spirometry (van den Bemt et al, 2014; Weiss et al, 2013; Miller et al, 2005).

Some studies state that for pre-bronchodilator microspirometry, a fixed cut-off point of $FEV_1/FEV_6 < 0.73$ is now preferred over the previous $FEV_1/FVC < 0.70$ to indicate airflow obstruction in pre-bronchodilator microspirometry (van den Bemt et al, 2014). This was suggested due to patients with COPD being missed, as the cut-off point was too low (Thorn et al, 2012). However, FEV_1 rapidly decreases with age, and FVC does not, so therefore this method overestimates the prevalence of COPD, particularly in the elderly (Miller et al, 2005), or those with reduced lung growth (Blair and Evelo, 2013); and those below 45 years, are often missed (Celli et al, 2015). Despite the benefits of $FEV_1/FVC < 0.7$ as a straightforward cut-off point, it is not dynamic unlike the Lower Limit of Normal (LLN) of FEV_1/FVC .

LLN is the favoured 'gold standard' over FEV_1/FVC to diagnose COPD with spirometry, as it considers demographic variables (Csikesz and Gartman, 2014). However, patients are likewise often missed with LLN criteria (Celli et al, 2015 cite Bhatt et al, 2014; Sansores et al, 2013). Uncertainty remains regarding cut-off points, yet COPD requires greater precision to diagnose than other diseases (Weiss et al, 2014). Nurses play an important role in the early diagnosis of COPD (Blair and Evelo, 2013), yet COPD screening rates remain low (Blair and Evelo, 2013; Sansores et al, 2013), which leads to COPD underdiagnoses (Weiss et al, 2014; Schirnhofner et al, 2007). Therefore, both research surrounding COPD screening, and nursing training needs to significantly improve to combat COPD underdiagnoses.

The Need for COPD Education

During the critical appraisal of literature and thematic analysis, it became apparent that education surrounding COPD was a necessary requirement not just for patients, but for practitioners and wider society. Nurses and the public must be made aware of the symptoms of COPD, to enable early detection (Suthar, Patel and Shah, 2015). Sansores et al (2013) identified the most common symptoms to be cough ($p=0.01$), dyspnoea ($p<0.001$) and wheezing ($p=0.01$). Despite symptoms being frequently present (Kotaki et al, 2017; Delgado et al, 2016; Roberts, Patel and Partridge, 2016; Estes et al, 2014; Weiss et al, 2014; Sansores et al, 2013), patients often adjust to symptoms, and do not accept the existence of their disease (Bragadottir et al, 2017). Bragadottir et al's (2017) study was a pioneer study of

the feelings and challenges patients and families face in relation to COPD. In Japan, patients commonly mistook the symptoms of COPD for natural ageing (Kotaki et al, 2017). Patients, professionals and the public need to be made aware of the risk factors, such as air pollution (Kotaki et al, 2017), indoor pollution (GOLD, 2017) and smoking (Spyratos, Chloros and Sichletidis, 2012).

Education needs to be improved in other aspects. Professionals commonly incorrectly diagnose patients with asthma, therefore triggering a requirement to distinguish between the two diseases (Koblizek et al, 2016; Weiss et al, 2014). In many studies, an incorrect dose of bronchodilator pre-spirometry caused asthmatics to be diagnosed with COPD (Weiss et al, 2014; Buist et al, 2007; Menezes et al, 2005). Weiss et al (2014) state that the awareness of COPD needs to be heightened in both patients and professionals, as poor knowledge and expertise are significant barriers to diagnosis (Haroon et al, 2015). Therefore, if education improves, the number of patients underdiagnosed will also (Koblizek et al, 2016). Furthermore, to combat underdiagnoses further, accurate and reliable spirometry readings are a necessity to achieve, which requires thorough training (Koblizek et al, 2016).

Practice Nurses at the Heart of COPD Screening

Some nurses are more aware of COPD than others depending upon speciality. Blair and Evelo (2013) discovered that family nurse practitioners were more likely to screen for COPD risk factors than other '*population-specific*' (women's health, paediatric, and geriatric) nurse practitioners. In the UK, primary care professionals are in an ideal position to detect COPD (Koblizek et al, 2016). However, Weiss et al (2014) discovered that GPs need to improve their medical education, to improve their support for COPD detection. Professionals must be trained and competent themselves, to be able to perform comprehensive patient assessments (Baxter et al, 2016). However, other studies state that primary care providers are most aware of COPD (Blair and Evelo, 2013). Yet, COPD is regularly underdiagnosed (Koblizek et al, 2016; Jones et al, 2014; Weiss et al, 2014; NICE 2016; Schirnhofner et al, 2007). A reason for this, may be that nurses do not always apply their knowledge to clinical practice (Blair and Evelo, 2013; Sansores et al, 2013).

Patient Education

If primary care professionals are more aware of COPD than others, why is COPD regularly undiagnosed in the UK? Perhaps the answer lies with public health awareness and patients, not healthcare professionals. A study has found that patients are reluctant to seek advice from their primary care provider, regarding any respiratory difficulties (Bragadottir et al, 2017; Weiss et al, 2014). This is frequently due to their adaptation to respiratory symptoms, or a lack of awareness of the disease (Suthar, Patel and Shah, 2015). Therefore, patients need to receive increased education, such as the obligation to quit smoking early on (Koblizek et al, 2016). Although Bragadottir et al (2017) study it incorporated relatives' understanding, which are likely to show similarities with the public's views. This study found that patients and their relatives lacked awareness of COPD. Therefore, connoting that widespread public health education is an effective intervention for the prevention, management and understanding of COPD (Centers for Disease Control and Prevention, 2011).

Improving Public Health Awareness

Patients also asserted the need for increased public awareness (Bragadottir et al, 2017), the benefits are: reduced stigma, as COPD is often perceived to be 'self-inflicted'; increased education, as sufferers often hide the disease as it is not recognised within society; increased awareness of the harms of smoking, benefits of cessation, and the need for screening; and lastly, the everyday challenge those with COPD face. Society's attitudes towards COPD need to be investigated, to advise forthcoming education, and create strategies that increase awareness (Haroon et al, 2015). Society is often unaware of the severity COPD imposes upon life, and frequently judge those who have it (Bragadottir et al, 2017). An improvement in public health awareness enhances education regarding risk factors, smoking cessation, and enables interventions to be achieved (Centers for Disease Control and Prevention, 2011).

Discussion

The purpose of this study was to discover the factors preventing the early diagnosis of COPD. In addition, the aim was to explore the role of early screening of COPD, as a means of combatting underdiagnoses. As a result, main findings arose to the surface: there is a requirement of increased education for both healthcare providers and patients. Moreover, there remains a conflict between case finding versus screening strategies within healthcare. Within the respiratory field, the prevalence of COPD amongst women is on the rise, yet gender inequalities still exist. The above factors contribute to the underdiagnoses of COPD today.

During the thematic analysis, a correlation between the factors emerged. Spirometry screening is required for diagnosis, but it cannot be undertaken in the absence of education. Nurses must be aware of the symptoms and risk factors, but also how to accurately diagnose COPD. Furthermore, gender is also interlinked, as nurses must be aware of the gender inequalities that lead to late diagnosis in women, due to stigmatisation of psychosomatic illness (Delgado et al, 2016; Modica et al, 2014). An overarching element that appeared following the thematic analysis, was 'stigma'. Patients are reluctant to seek medical advice due to perceived stigma from professionals (Bragadottir et al, 2017).

To combat COPD underdiagnoses, we need to target patients in both primary care and through public awareness. In addition, women need to know that they are more susceptible to the harms of smoking (GOLD, 2017; Blair and Evelo, 2013), consecutively with research undertaken to determine why this susceptibility exists. Is it due to the pathophysiological make-up of women? Studies suggest that female hormones impact susceptibility, others state there is a genetic trend (Jenkins et al, 2017). Although the answer is not clear, the drastic increase in prevalence of COPD needs to be ceased. This can only be achieved by early diagnosis of COPD, and cannot be achieved by case-finding alone. Only 85% Of COPD in women is caused by smoking (Blair and Evelo, 2013 cite Cote and Chapman, 2009), and even then, patients will not necessarily be symptomatic (Kathirvel Senthilnathan et al, 2016; Wisnivesky et al, 2014). No public health material exists today specifically targeting the female population, so the responsibility falls to nurses, to educate their patients.

Quality of care may be improved through the introduction of broad COPD screening. This method not only identifies women with COPD who have been missed, but men also (Wisnivesky et al, 2014; Sansores et al, 2013; Menezes et al, 2005). In addition, these

patients may be asymptomatic (Kathirvel Senthilnathan et al, 2016; Wisnivesky et al, 2014). Therefore, case-finding is unlikely to identify these patients, and although it is a cost-effective method, the implementation of screening needs to be considered. Further research must be undertaken to compare the two methods, and to find a way of implementing screening to find those undiagnosed, who with case-finding, would have otherwise been missed. Moreover, research needs to be conducted to identify screening methods that are affordable, and can be performed in primary care within availability of staff and resources.

In primary care, nurses and GPs are in a prime position to identify those with COPD, so why are diagnostic rates so low? As identified in the literature review, many professionals are incorrectly diagnosing patients with asthma (Koblizek et al, 2016; Weiss et al, 2014; Buist et al, 2007; Menezes et al, 2005), or employing inefficient diagnostic tools, such as microspirometry (Estes et al, 2017). Diagnostic spirometry is expensive to purchase, yet questionnaires and microspirometers are not (Dirven et al, 2013). So why are precursor tools not being utilised in primary care? Some studies state those in primary care are exceptionally aware of COPD, and utilise precursor tools (Roberts, Patel and Partridge, 2016; Blair and Evelo, 2013). Therefore, perhaps the accountability lies elsewhere.

It may be suggested that COPD underdiagnoses lie with the fault of significant organisations, who are not aware of the true impact early diagnosis would produce. COPD costs the NHS £1.9 billion per year (British Lung Foundation, 2017), and in the UK, 25,000 people lose their lives annually (Health and Safety Executive, 2016). As one of the biggest killers, which is predicted to be the third largest by 2020 (GOLD, 2017; Kotaki et al, 2017; Weiss et al, 2014; Wisnivesky et al, 2014; Blair and Evelo, 2013), change in the current identification needs to be achieved. Once this is addressed, the prevalence of underdiagnoses, rates of lung decline in patients, quality of life, and financial impact upon health care systems, will all significantly improve (Csikesz and Gartman, 2014). A healthcare system that provides this, will ultimately improve patient care. COPD will be caught earlier, which will improve the effectiveness of interventions and disease management (Wisnivesky et al, 2014). Although there is evidence that COPD identification methods are moving towards a more generalised screening (Gaduzo et al, 2015; Wisnivesky et al, 2014; Sansores et al, 2013), little research exists to support this, and therefore needs to be undertaken. Research needs to particularly focus on

screening methods in primary care that will identify a higher number of COPD cases, to reduce the global burden of the disease.

Community Pharmacists are in a prime position to identify patients with COPD through early case-finding. Pharmacists are regularly the first port-of-call for patients expressing signs of COPD such as breathlessness, risk factors such as smoking, and are able to screen patients at risk (van der Molen et al, 2017).

Many UK guidelines are significantly outdated, and GOLD (2017) state that no studies pertaining to early screening exist, and fail to identify a necessity for these studies to be undertaken. However, Gaduzo et al, (2015) identified that the two million patients with undiagnosed COPD may benefit from screening, but there is a current lack of research and agreement regarding the benefits of screening versus case-finding. Still, on the other hand, the 2011-2016 NICE guidelines do not cover *“COPD prevention, screening or case finding”*. Yet, NICE are responsible for providing evidence-based guidance to the NHS (NICE 2017). Therefore, the NICE (2011) guidelines are a barrier to the early diagnosis of COPD, as they do not outline screening and case-finding guidance. In 2013, the UK National Screening Committee (UK NSC) stated that *“a screening programme for COPD is not recommended at this time”* (p.1). Yet, there is no information to state whether this guidance still exists, four years later. The authors themselves suggest that screening may be a useful intervention to identify COPD early-on in patients, and enable early treatment and interventions. Key organisations such as NICE and GOLD are in a prime position to be ‘opinion leaders’; to enable the implementation and diffusion of ‘early generalised screening’ through primary care (Rogers, 2003). However, this cannot be done until thorough research is undertaken.

Recommendations

1. Further research must be done to compare the benefits of screening versus case-finding, to identify those with COPD who are asymptomatic; discover a method that is cost-effective, and diagnoses the ‘missing millions’ (Gaduzo et al, 2015)
2. Increase the training and education of nursing and allied healthcare professionals, regarding: COPD; screening with questionnaires and microspirometry; signs and symptoms; risk factors; diagnostic testing with spirometry

3. Professionals worldwide must be made of the necessity of spirometry to diagnose COPD, as outlined by GOLD (2017), and the ability of questionnaires and microspirometers as pre-cursor tools
4. Improvements in guidelines produced by the key organisations, are integral for a widespread change in early detection; particularly by diffusion of ideas (Rogers, 2003)

Overarching Recommendation

To undertake a large-scale, global study comparing case-finding with generalised screening, for the early detection of undiagnosed COPD.

Conclusion

The purpose of the review was to consider factors influencing early COPD screening, within primary care. Although there is a significant lack in evidence (GOLD ,2017), it is suggested that screening may have a greater opportunity to identify those who would have otherwise been missed (Sansores et al, 2013), despite GOLD (2018) stating that the yield of COPD diagnosis is sufficiently high. Although Sansores et al’s study was limited, it is moving in the direction of improving early diagnosis, to identify patients before they reach moderate COPD (GOLD, 2017). Ultimately, although it is suggested that spirometry screening for COPD should be employed globally as an assessment tool (GOLD 2018), there is a lack of evidence to support this, and therefore, evidence must be produced. Nurses in primary care are in the best position to implement early screening (Weiss et al, 2013), but education, and accurate spirometry are integral to this role.

Tables

Table 1

First Author	Purpose of Study	Findings	Statistical Significance of Findings
van den Bemt	To determine the diagnostic accuracy of pre-bronchodilator (BD) FEV1/FEV6 ratio from microspirometry, relative to a post-BD FEV1/FEV6 ratio from diagnostic spirometry. The patients were referred for spirometry by their GPs because of respiratory symptoms indicative of COPD.	A subject with a negative microspirometry test was unlikely to show airflow obstruction in a subsequent diagnostic spirometry. Microspirometry does not accurately diagnose COPD.	Statistically significant (SS)
Blair	Primary purpose: <i>"Discuss risk factors for COPD and identify at-risk populations"</i> ; in relation to the speciality the NPs work within. Secondary purpose: <i>"To report the findings of a recent survey of nurse practitioners (NPs) in Colorado regarding their knowledge about the risk factors of COPD"</i> (p.123).	As hypothesised, parametric results reported that 'population-specific NPs' (paediatric, gerontological, and women's health NPs) identified less risk factors for COPD than both family NPs and adult NPs.	Not statistically significant (NSS)
Wisnivesky	To investigate the prevalence of COPD, characterised by airflow obstruction in spirometry in a group of asymptomatic smokers (5 or more years) with no history of asthma, COPD or respiratory symptoms; and to identify risk factors of abnormal spirometry.	The prevalence of undiagnosed airway obstruction in this population was 2.3%, therefore suggesting it is possible to diagnose asymptomatic smokers with airway obstruction. However, further research needs to be performed into the benefits of early diagnosis and cost-effectiveness of screening.	NSS
Bragadottir	To describe the lived experience of both patients and their relatives following a COPD diagnosis. The authors' main aims were to decipher: a greater understanding of shame, the course of events as COPD manifests itself in the participants' life, especially the experience of receiving the diagnosis itself, and the obstacles the patients and families face.	The researchers identified five themes: <ol style="list-style-type: none"> 1. 'Burden of shame and self-blame': participants believed COPD was brought on by themselves yet participants felt disdain towards people who believe smoking caused their COPD. 2. 'Enclosed in addiction': Nicotine addiction was found at the core of the participants' experiences, yet patients struggled to name and face the addiction. 3. 'Living in parallel worlds': patients would often hide their COPD from themselves and others 4. 'Realising the existence of the disease': Patients struggled to acknowledge the existence of the disease despite warning signs of progression 5. 'A cry for empathy': Patients and their relatives both expressed a lack of understanding from friends, family and society, and assert the need for public health awareness on COPD ^shall I cut the above down and make it brief?	N/A
Weiss	To evaluate COPD prevalence in the over- 40 years population, and compare the detection strategies for COPD in primary-care settings (GP surgeries).	7.5% of participants has FEV1/FVC<0.7 and FEV1<80% of predicted, indicating a COPD diagnosis of grade II+; however, only 22.4% of these patients had a previous diagnosis of COPD, indicating that COPD is widely underdiagnosed. The low participation rate of both GPs and patients signposts that COPD healthcare and public health awareness needs to be vastly improved. COPD requires greater precision to diagnose than other chronic diseases.	SS
Sansores	The authors found a gap in knowledge when doing their literature search: that additional information is needed concerning the usefulness of spirometry when smokers are not selected based on respiratory symptoms. This is the first study to simultaneously compare both diagnostic strategies. To study this, the researchers compared two	Prevalence of COPD was 10.1% for the case-finding strategy and 13.3% for the smoking cessation programme strategy (SCS) (p<0.01). According to LLN, the screening group was higher than the case-finding group. The authors suggest these results are due to the greater prevalence of smoking in the screening group (pack/years). The authors analysed the results using a multivariate	1999 participants were analysed for the case-finding strategy versus 782 participants screening

	<p>populations to determine which technique is more effective at diagnosing COPD early: symptomatic smokers (the presence of respiratory symptoms) undergoing spirometry (case-finding), versus a screening programme during a smoking cessation clinic (spirometry was undergone as part of a medical evaluation).</p> <p>An additional objective was to determine the predictive value of respiratory symptoms to encourage an early diagnosis of COPD.</p>	<p>logistic regression analysis which found that dyspnoea was the only common predictor of COPD in both samples. Risk factors for COPD were: male gender ($p<0.001$), cough ($p=0.01$), dyspnoea ($p<0.001$), wheezing ($p=0.01$) and age (being older) ($p<0.001$). However, age may be due to the natural decline in lung function that is associated with ageing (Quanjer <i>et al.</i> 2012).</p>	<p>(2.56:1 ratio). It is difficult to generalise the results when the difference in sample populations is so vast (Elsevier 2017).</p>
Roberts	<p>The purpose of the study was to compare which biases encourage GPs to refer patients for suspected COPD in men, versus women.</p>	<p>Significant statistical differences in the confirmation of 'correct' COPD diagnoses were: men=72% and women=56% ($p=0.001$). A 'definite COPD' diagnosis was confirmed significantly more frequently in men than women (87.5% and 73.9% respectively, ($p=0.021$, $n=180$)). A 'suspected COPD' diagnosis was confirmed more frequently in men also: 60.9% of men and 43.2% of women ($p=0.004$, $n=265$). Therefore, men were more likely to have COPD suspected by their GP, and a confirmed diagnosis. Women however, were more likely to report allergies (30.4%=women vs 17.0%=men ($p=0.099$), but not significantly different), but less likely to report breathlessness as their main symptom.</p>	SS
Delgado	<p>To analyse decision-making in primary care for men and women with identical COPD as a function of the gender of the family physician (FP).</p>	<p>Smoking was identified as the most prominent risk factor for males, by both female (95.6% vs 67.1%) and male FPs (79.8% vs 62.5%). In addition, men were more likely to be suspected of COPD than women, by both the female (84.4% vs 49.9%) and male (78.5% vs 57.8%) FPs. The FPs were more likely to diagnose COPD if the vignette was a man (34.5% higher when the FP was female, 20.7% higher when the FP was male). This supports that women usually receive a delay in COPD diagnosis, and that COPD is regularly underdiagnosed in women. It is therefore confirmed that gender is a variable that influences characteristic for diagnostic behaviour.</p>	SS
Kotaki	<p>To evaluate the effectiveness of a cooperative healthcare model for early detection and diagnosis in COPD. The purpose of this study was to improve the early management of COPD through early detection.</p>	<p>30/293 patients were suspected of moderate COPD. Between the suspected COPD and non-suspected COPD groups, there were many differences in symptoms. COPD prevalence was highest in smokers (21%), followed by the ex-smokers (13%), passive smokers (7%) and non-smokers (7%). Of the 6 patients with suspected COPD, only 2 were diagnosed with COPD. The pollution concentrations were higher for Ōmuta on average compared to Japan in both 2012 and 2013. The authors have suggested that therefore their study found a higher prevalence of COPD in one region (Ōmuta), in comparison to a NICE study of all Japanese regions (Fukuchi <i>et al.</i> 2004). Those with COPD had lower FVC, %VC, FEV1, FEV1/FVC readings (all $p<0.00$).</p>	SS
Estes	<p>To undertake a case-finding program for COPD, in a community clinic that was not screening for COPD.</p>	<p>In total, 27/39 patients (69%) had a spirometry reading and COPD Questionnaire outcome that agreed (i.e. both positive or both negative for COPD). Therefore in 12/39 patients (31%) the microspirometry and questionnaire outcomes disagreed. This indicates that microspirometry and the COPD Questionnaire were over estimating the prevalence of COPD, with 10 false positives in comparison to only 2 true positives. 10% of the sample had COPD (4/39): All 4 patients with COPD had GOLD type II (moderate COPD). 2 patients were 'true positives', 2 patients were 'false negatives'.</p>	NSS

Further Reading and Useful Information

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Appendices

Appendix 1 - GOLD COPD Grading

FEV₁ (% predicted)	
GOLD 1	≥ 80
GOLD 2	50-79
GOLD 3	30-49
GOLD 4	< 30

Taken from: The Global Initiative for Chronic Obstructive Lung Disease (GOLD). 2017. *Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease*. [Ebook] Global Initiative for Chronic Obstructive Lung Disease. Available from: <http://goldcopd.org/gold-2017-global-strategy-diagnosis-management-prevention-copd/> [4 July 2017].