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Spirometry in primary care for case finding and management of chronic obstructive pulmonary disease

primary care diagnostic technology update

Clinical Question

What is the value of spirometry in improving the diagnosis and management of chronic obstructive pulmonary disease in primary care?

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ADVANTAGES OVER EXISTING TECHNOLOGY

An alternative method for detecting chronic obstructive pulmonary disease (COPD) is the use of symptom scoring. Pulse oximetry is not useful for the initial diagnosis of COPD, but is used in assessing severity at a later stage of disease. Peak flow is not used to diagnose COPD, but serial measurements may be used in the initial assessment of respiratory symptoms to rule out asthma.

Symptom scoring

Symptom questionnaires have the disadvantage of missing those who deny (or are unaware of) symptoms, when clinically they are dyspnoeic, wheezing, or have a cough; or have no symptoms, but have measurable impairment of lung function. Even validated symptom-scoring tools miss up to 20% of cases of COPD (sensitivity 80%, specificity <50%).¹ Several population surveys (for example, in the US, China, and Europe) have consistently demonstrated that >35% of people with severe COPD (Global Initiative for Chronic Obstructive Lung Disease [GOLD] stage three) deny having symptoms of cough, phlegm, wheeze, or shortness of breath.²

Pulse oximetry

Pulse oximeters are increasingly available in primary care but their role in monitoring and diagnosis of COPD is not yet clearly established. Pulse oximeters cannot measure carbon dioxide levels or pH, which are crucial determinants of admission and hospital intervention, such as non-invasive ventilation. Early disease does not cause hypoxia, and therefore pulse oximetry cannot be used for early detection. However, oximetry is used as a guide to determine which patients with COPD should be considered for long-term oxygen therapy.³ There is currently a paucity of published research about the use of pulse oximetry in primary care for COPD diagnosis or as an aid to decision making during exacerbation.

Peak flow measurement

Peak expiratory flow rate (PEFR) is useful in the initial assessment of respiratory symptoms. Serial measurements can help distinguish between variability in asthma and relatively fixed obstruction in COPD. PEFR is not reliable for the diagnosis of COPD, as it cannot distinguish between obstructive and restrictive disorders, and lacks the flow/volume, volume/time graphs of spirometry.⁴ Forced expiratory volume in 1 second (FEV₁) and PEFR are not proportionate in many individuals, and are therefore not interchangeable for classification of disease and management decisions.⁵

DETAILS OF TECHNOLOGY

COPD is characterised by progressive, largely irreversible, obstruction to airflow. COPD severity is classified on the basis of spirometry results (including FEV₁ [per cent of predicted value], forced vital capacity [FVC], and FEV₁/FVC) compared to reference tables. Hand-held and desk-top spirometers detect flow volume and rates using a variety of flow sensors, including turbine, heated or non-heated Fleisch pneumotachograph, and ultrasonics. Several devices are available on the market, and one study reviewed the technical properties of 10 different spirometers designed for use in general practice.⁶ Devices were tested in laboratory and primary care settings, and user-friendliness was assessed. Some devices can transfer data by telephone (such as Spirotek® [Medical International Research]); landline, or mobile phone). Many have storage capacity and allow use in the field (for surveys or patient use), so data can be downloaded at a later date for analysis (such as EasyOne Worldspirometer [ndd Medizintechnik AG]). However, these devices cannot be used for remote real-time monitoring of patients.

PATIENT GROUP AND USE

Screening for COPD is not yet recommended

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in the UK but some groups have called for better detection to establish prevalence worldwide (for example, The Burden of Obstructive Lung Disease Initiative⁷). Spirometry should be considered in adults who have risk factors (smokers, ex-smokers, occupational exposure) and/or symptoms suggestive of lung disease. Spirometry could also be used (in those at risk) during NHS health checks, or as part of smoking-cessation activity using lung age as a motivator to quit.⁸

Initial testing could occur in community locations or surgery waiting rooms, but diagnosis should be confirmed by post-bronchodilation measurements in line with recommendations from the National Institute for Health and Clinical Excellence (NICE) and the British Thoracic Society (BTS). NICE also recommends that 'all health professionals involved in the care of COPD patients should have access to spirometry and be competent in the interpretation of the results'.

Competent use of the technology currently available needs training, experience, and patient cooperation to obtain accurate and reproducible results. Advances in technology and widespread internet and mobile phone use have opened up the possibility of automated transfer of data from community- or home-based spirometry to primary care teams (or respiratory support team). The use of remote and home monitoring is currently under investigation.

IMPORTANCE

A quarter of smokers develop COPD: it is the fourth commonest cause of death worldwide and cause of 25 000 deaths annually in the UK. Ninety per cent of COPD is caused by cigarette smoking, and over half of cases are currently undetected in the UK. The BTS report, *The Burden of Lung Disease*, stated that in 2004 alone there were 24 million GP consultations for respiratory disease.⁹

PREVIOUS RESEARCH

Accuracy compared to existing technology

Many hand-held or desktop devices have evidence for good accuracy compared to respiratory laboratory standards.^{6,10,11} For an overview of devices on the market and their reported accuracy see the detailed spirometry report at the Department of Primary Health Care Monitoring and Diagnosis in Oxford (MaDOx; madox.org).

Impact compared to existing technology

The increased availability of spirometers outside specialist hospital departments has led to improved access in primary care and

the potential for wider use. Newer spirometers are user-friendly and have the capacity for self-monitoring. With the advent of telemedicine and internet transmission of data, many more patients could have access to a diagnostic screening and/or monitoring service.

Economic impact

Respiratory disease costs the UK £6.6 billion: £3 billion in costs to the care system, £1.9 billion in mortality costs, and £1.7 billion in illness costs.⁹

Health Technology Assessments

One relevant Health Technology Assessment report was identified from the UK, which included a cost-effectiveness analysis of COPD case finding using spirometry and smoking cessation advice in primary care. Taking account of assumptions about the impact of early diagnosis and improved smoking-cessation rates, under the base case analysis, the cost per life-year gained was £713.16 and the cost per quality-adjusted life-year gained was £814.56. Their conclusion was that 'under current decision making conditions, this is a very favourable cost effectiveness ratio'.¹²

Relevant guidelines

NICE clinical guideline. *Chronic obstructive pulmonary disease [updated]. Clinical guideline CG101*. <http://guidance.nice.org.uk/CG101> [accessed 2 Aug 2011]. NICE excludes a diagnosis of COPD in people without symptoms when FEV₁/FVC is <0.7 and FEV₁ is >80% predicted (GOLD classifies these as mild COPD even without symptoms).¹³ The continuing discrepancy between NICE and GOLD guidance is unhelpful for patients, doctors, policy-makers, and researchers, because there is substantial evidence that reported symptoms are unreliable for diagnosis.

Methodology

Standardised methodology was applied in writing this report, using prioritisation criteria, and a comprehensive, standardised search strategy and critical appraisal. Full details of these are available from madox.org.

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Competing interests

The authors have declared no competing interests.