Attaining a correct diagnosis of COPD in general practice


Summary
Background: Chronic obstructive pulmonary disease (COPD) is common. Diagnosis should include objective evidence of airways obstruction and spirometry is recommended in guidelines and the general medical services contract in the UK. We assessed the impact of spirometry in general practice.

Method: We determined by questionnaire the availability, staff training, use and interpretation results of spirometry in 72% of general practices in Wales. We reviewed the diagnosis of COPD previously made in two general practices without spirometry.

Results: Most practices had a spirometer (82.4%) and used it (85.6%). Confidence in use and interpretation of results varied widely: 58.1% were confident in use and 33.8% confident in interpretation. Spirometry was performed more often if confident in use and interpretation (both $P < 0.001$) and was related to greater training periods ($P < 0.001$). Spirometric confirmation of COPD varied widely (0–100%, median 37%). Of the 125 patients previously diagnosed with COPD 61 had spirometric confirmation, while 25 had reversible obstruction (range 210–800 mls), 34 had normal and 5 had restrictive spirometry.

Conclusion: Despite incentives to perform spirometry in general practice, lack of adequate training in use and interpretation suggests use is confounded and the diagnosis of COPD is likely to be made on imprecise clinical grounds.

Introduction
Chronic obstructive pulmonary disease (COPD) is a major cause of morbidity and a leading cause of
death with age adjusted mortality figures still increasing.\textsuperscript{1,2} It presents a major challenge to healthcare provision with an overall prevalence of 10\% in the community, rising to 26\% in patients aged over 45 years for chronic airflow limitation.\textsuperscript{3-5} This is COPD identified in surveys, but it is likely that only 25–50\% of such patients are known to their general practitioners.\textsuperscript{4-8} The reasons for under diagnosis include under reporting of symptoms by patients, their incorporation in asthma lists and the limited use of spirometry in general practice.\textsuperscript{3,9-14}

There has been added impetus to obtaining a correct diagnosis of COPD, particularly in primary care, with the Global initiative for Chronic Obstructive Lung Disease (GOLD),\textsuperscript{9} the British Thoracic Society (BTS) management guidelines\textsuperscript{15} and the National Institute for Clinical Excellence (NICE) guidelines in the United Kingdom.\textsuperscript{16} The new service contract for general practitioners in the United Kingdom includes the creation of COPD registers and the use of spirometry as an objective component of diagnosis and monitoring of disease progression for which practices will be rewarded financially.\textsuperscript{17}

In general practice, symptoms, examination and smoking history have been used to diagnose COPD. Diagnosis made on this basis may be inaccurate due to the range of presentations from asymptomatic (whilst significant lung impairment on objective testing) through to multiple non-specific symptoms such as shortness of breath, cough, wheeze and sputum production, which overlap with other respiratory disorders, not least asthma.\textsuperscript{18,19} As COPD is a mainly irreversible and progressive disease with serious systemic complications\textsuperscript{20-22} and a sub-clinical phase to these problems, precise and early diagnosis is essential.\textsuperscript{9}

The recommended diagnosis of COPD rests on an appropriate history and objective confirmation of airways obstruction.\textsuperscript{5,15} A peak expiratory flow (PEF) of <80\% predicted will detect over 90\% of patients with COPD, though the specificity is low at 82\%.\textsuperscript{23} Spirometry is widely considered necessary to identify patients precisely and detects milder degrees of airways obstruction than PEF. Additionally severity can be defined, indicating those most at risk of exacerbations, persistent hypoxaemia or cor pulmonale.\textsuperscript{24-26} Determination of the presence or absence of reversibility of airways obstruction to bronchodilator treatment has been recommended, though there is controversy over reliance on this test,\textsuperscript{27-29} which is currently in the BTS guidelines\textsuperscript{15} and a requisite for diagnosis in the new contract for general practice.\textsuperscript{17}

We undertook a questionnaire-based survey during the latter six months of 2003 to determine the level and acceptability of spirometry usage in general practice in the Welsh health region in the UK. Additionally, to determine the impact of spirometry on the diagnosis of COPD in general practice we studied patients with previous non-spirometry supported diagnosis of COPD.

Method

Questionnaire

A questionnaire (Appendix A) was sent to 371 (72\%) randomly selected general practices of the 518 in Wales.\textsuperscript{30} The questionnaire was directed to the main spirometer user or the respiratory medical professional, with a duplicate sent to practices not responding to the initial request. Questions related to: the availability of spirometry; access to local lung function without consultant physician referral; confidence in use (including calibration); interpretation of results; the type and length of training, as well as the number of their registered COPD patients investigated with spirometry.

Patients with previously diagnosed COPD

We studied 125 patients drawn from two local general practices, reflecting the population profile of Cardiff. They were selected on the basis of a diagnosis of COPD made within the practice (based on UK national codes READ: H3, H36-H3y, H3z and H32), based on history and examination without spirometry. Patients were studied when clinically stable, defined as no requirements for antibiotics or corticosteroids and no change in respiratory symptoms beyond normal day to day variation in the last month. Patients refrained from using short acting inhaled bronchodilator treatment for 6 h and all other inhaled therapy for the preceding 12 h.\textsuperscript{15}

Spirometry was carried out and interpreted by one of three experienced users (CB, AAI, TAF) using Vitalograph alpha (Bucks, UK) or Microlab 3300 (Micromedical, UK) spirometers. Both machines were calibrated and serviced according to the manufacturer’s direction and the same machine was used for an individual patient.

Three acceptable forced manoeuvres were performed with consistent verbal encouragement to obtain at least two recordings with both the forced expiratory volume in the first second (FEV\textsubscript{1}) and forced vital capacity (FVC) within 5\% or 0.1 l of each other.\textsuperscript{31} The ratio FEV\textsubscript{1}/FVC was recorded.

Patients with airways obstruction (FEV\textsubscript{1}/FVC < 0.7, FEV\textsubscript{1} < 80\% predicted) underwent reversibility...
testing using 400 mg salbutamol via a volumatic spacer with tidal breathing. Spirometry was repeated 15 min later. Reversibility was classed as an increase in FEV₁ of 15% and 200 mls. Patients with non-reversible airways obstruction were classified as COPD. Patients without airways obstruction or with reversible airways obstruction were referred back to their GP for further management.

Statistical analysis

Descriptive statistics and analysis were performed using Statistics Package for Social Sciences (SPSS) version 11.0. Differences between groups were determined by Chi-square or Mann–Whitney U tests.

Results

Questionnaire

The response rate was 61.6%, 227 of the 371 practices contacted, with coverage across the area. Each practice was asked the size of the population they covered. From 214 practices reporting, the estimated population served was 1,415,647 individuals (approximately 49% of the Welsh population).

Spirometry

Of the 227 responding practices, 187 (82.4%) possessed a spirometer of which 160 reported usage. Of the 27 practices not reporting use, 11 never used; 12 had recently purchased their machine and four practices did not answer the question. Of the 160 performing spirometry, 35 (21.9%) used it for diagnosis in every suspected case of COPD with a further 54 (33.8%) using it often; while 71 (44.4%) used it sometimes or rarely. Spirometry was carried out in 111 of the 160 practices by the practice nurse or nurse practitioner; in 15 by the general practitioner; in 34 by both general practitioner and nurse.

Level of confidence with the use of a spirometer and interpretation of results

Of the 160 practices performing spirometry, 93 (58.1%) were confident using the spirometer while the remaining 67 reported less confidence. Of those using the spirometer in every case of COPD diagnosed, 28 of 35 (80%) were confident with use, whilst of the 54 using the spirometer often, 40 (74%) were confident. Spirometry was performed more often in practices confident in use, compared with those with less confidence (P<0.001).

Only 54 (33.8%) of practices reported satisfaction with interpretation of results, while 104 practices reported limited or no confidence (two no answer). Where spirometry was used with every case of COPD, 62% practices were confident with interpretation of the results. Of the 54 practices reporting often use, 52% were confident with interpretation. Again, spirometry was performed more often in those who were confident in interpretation of the result, compared with those with less confidence (P<0.001).

Training in the use of spirometry

Of the practices performing spirometry, 121 reported median training in use of the equipment of 4, range 0–30 h of which 10 reported no training. However, the median training for those confident in using their spirometer (n = 69) was 6 range 0–30 h; limited confidence (n = 44) 3, range 0–20 h; not confident (n = 8) 1, range 0–14 h, P<0.001 (Fig. 1). For practices with a spirometer but not using it (8/11 responses) median training was 0.5 (range 0–4) h.

Training in the interpretation of spirometry

The median period of training in interpretation of results for the 90 practices responding and using spirometry was 2, range 0–30 h of which 13 reported no training. Of those confident with interpretation, (n = 24) the median training was 4, range 1–15 h; limited confidence (n = 53)
2.0–30 h; not confident (n = 13) 0.6, 0–3 h, 
$P < 0.001$, Fig. 2. Training in interpretation for those 
who possessed a spirometer but did not use it (6/11 
responses) was median 0 (range 0–2.5) h.

There was no detailed information on how 
training was delivered or assessed. The provision 
of spirometry training was varied, encompassing 
specific spirometry courses, hospital based and 
pharmaceutical company based, as well as one-to-
one tuition.

Use of spirometry to confirm diagnosis
Spirometric confirmation of COPD ranged from 0% 
to 100%, with a median of 37% in the 87 
respondents giving this information. No details 
were asked regarding reversibility. The percentage 
of patients with COPD confirmed by spirometry 
within practices confident with use was median 
50.5%, n = 50, $P = 0.155$ and interpreting median 
54.7%, n = 34, $P = 0.022$ compared with those with 
less confidence (confirmation median 29.4%, n = 25 
and 30.7%, n = 39, respectively).

Practices without a spirometer
Of the 40 practices without a spirometer, three had 
open access to hospital lung function, 31 did not 
and six gave no answer. Only one practice reported 
using hospital lung function in every case of COPD 
and two used it sometimes.

Patients with previously diagnosed COPD
Of the 125 patients, 62 were female and 63 male; 
mean age 64.3 years, range 43–85. History of atopy, 
family history of asthma and triggers did not 
separate out into the group who consequently reversed. Six patients had never smoked, the rest 
had a median pack year history of 40, range 1.5–120.

Airways obstruction was found in 86 patients of 
which 61 did not reverse and according to the 
guidelines were classed as COPD$^{14}$ (Fig. 3). Of these 
patients 13 had severe; 24 moderate; and 24 mild 
disease. This included two non-smokers with a 
history of chronic asthma who had non-reversible 
severe airways obstruction. The remaining 25 of 
these 86 patients reversed their FEV$_1$ by >15% and 
200 ml. The median increase was 270 ml, range 
210–800, a median 27% FEV$_1$ increase, range 
17–87%.

A restrictive disorder (low FEV$_1$ and FVC, with 
maintained or elevated FEV$_1$/FVC) was found in five 
patients and a further 34 patients had normal 
spirometry. Of the six who had never smoked, four 
had normal spiromograms.

Therapies
Medication varied with 61 receiving inhaled cortico-
steroid, 86 short acting $\beta_2$ agonist, 43 long acting 
$\beta_2$ agonist, 23 ipratropium bromide, three tiotro-
pium. The median dose of inhaled corticosteroid 
(betamethasone equivalent) in users was 800 $\mu$g, 
range 100–2000 $\mu$g (Table 1). Of the 23 patients 
with COPD and a FEV$_1$<50%, 14 were not on long 
acting bronchodilators ($\beta_2$ agonist or tiotropium), 
seven were not on inhaled corticosteroid, (and a 
further seven were on inappropriately low doses). 
None had undergone a pulmonary rehabilitation 
programme.
Discussion

Our random sample of 371 general practices with a response rate of 61% gave us information on spirometry use in 44% of the practices. This coverage allows some conclusions to be made regarding the provision and practice of spirometry. Over 80% of practices in our sample, had access to spirometry within their practice and of these, nearly 90% were using the instrument. This is greater than previous reports of 39–69% of practices having spirometers and appears to be a good response to various guidelines and forthcoming pressure for general practice services to take on a primary role in the diagnosis of COPD.10,11

The majority of spirometry usage was by practice nurses with a modest (30%) usage by general practitioners. This suggests spirometry is delegated to nurses and raises issues of training and confidence in the use of this equipment in a staff group with diverse roles within general practice. This finding may be reflected in the levels of confidence reported by the practices with the use spirometry and the interpretation of the results obtained. While there appears to be some satisfaction with 58% of practices confident with the performance of spirometry, 66% reported varying degrees of lack of confidence with the interpretation of the data produced.

An explanation of the confidence issue, particularly relating to interpretation, is the great variation in the time spent on training both in use and interpretation. This was evidenced by the wide range of reported training in the use of the spirometer from none to an estimated 30 h of training, with a median value of 4 h. Our respondents reported experience suggests less training had been devoted to interpretation of results with 14% reporting no training, than in the use of the spirometer where 8% reported no training. Not surprisingly the most confident practices reported the greatest amount of training. This reflects a lack of a recognised training programme with refresher courses within Wales. Our survey revealed that training is obtained in a variety of means and there appears to be no consistent or identifiable standard with appropriate assessments and review of skills to ensure a high quality use and interpretation of spirometry results by any group of health professionals.

A consequence of the current pattern of use we found is the wide range of spirometric confirmation of the diagnosis of COPD. The median of only 37% of patients having objective confirmation of their diagnosis seems low, but is greater than the 18% confirmation of COPD reported in 2000.33 Many
factors may keep the use of spirometry at a low level, among which the issues we have highlighted of poor or non-existent training and lack of confidence in staff carrying out and interpreting spirometry. Thus, there may be increasing numbers of spirometers in general practice but there is under utilisation in the diagnosis of COPD, despite the published guidelines.\textsuperscript{9,15} Reversibility testing was not explored by our questionnaire, but it might be argued that reversibility testing is not an issue in view of the low usage of spirometry and the lack of confidence in the interpretation of the data generated. These issues might be addressed by the new contract for general practice, which offers financial incentives if spirometry is achieved in up to 90\% of the COPD patients within the practice and spirometry and reversibility achieved in 90\% of new cases. However, without the parallel provision of adequate training in use and interpretation of spirometry, and no assessment of the quality of the data produced, this approach is unlikely to materially change the current standard of spirometry in general practice, which with appropriate training, primary care spirometry can be accurate and valid.\textsuperscript{34,35}

The current state is compounded by the very limited access to lung function laboratory assessments for most of the practices we surveyed, which contrasts with reported levels of access of 11–75\%.\textsuperscript{10,11} Such differences may reflect aspects of geography and previous decisions on health investment and development of services. Indeed, much of the respiratory function testing in secondary care is carried out in combined cardiorespiratory laboratories with only three separately identified lung function laboratories in Wales. It may not be appropriate for every practice to possess a spirometer and trained user, but there should be provision within an area for sharing a service between practices, particularly in thinly populated large geographical areas. We do accept that a limitation of this study is the self reported nature of the questionnaire however this was the only feasible option to encompass the widespread responses from a large sample of the general practices.

The consequence of the limited use of spirometry to confirm the diagnosis of COPD is that 31\% of patients diagnosed with COPD on clinical grounds did not have evidence of airways obstruction. A 20\% sub-group of patients had reversible airways obstruction and were likely to fall into the category of asthma in view of the magnitude of their FEV\textsubscript{1} response. This study reaffirms earlier work suggesting that COPD cannot be reliably diagnosed simply on clinical grounds in primary care. While objective assessment of airways obstruction clarifies not only COPD but asthma and other respiratory disorders. Furthermore, in the COPD patients there was a degree of under prescription of anticholinergic therapy (15/61), relative over prescription of high doses of inhaled corticosteroids and a moderate use of long acting \beta\textsubscript{2} agonists. Whilst airways obstruction is not the only indicator for prescribing inhaled corticosteroid or long acting bronchodilator, there appeared relative lack of use of these in the more severe groups. After accurate diagnosis of COPD, attention should be drawn to associated indicators of severity including exacerbation frequency, exercise capacity and body mass index in order to optimise management options including pulmonary rehabilitation.

This survey of spirometry in general practice revealed deficits in the use and interpretation of spirometry, due to low levels of validated training and a lack of open access to lung function testing for practices without a spirometer. The introduction of a new GP contract gives an opportunity to address the deficits in the diagnosis of COPD in the UK. In a review of 125 patients with COPD diagnosed on clinical grounds, a high level of misdiagnosis of COPD was found and would be addressed by greater use of spirometry. In view of the implications of failure to diagnose COPD and the magnitude of the problem worldwide this study reinforces the view that more attention needs to be focussed on COPD patients to ensure accurate diagnosis and implementation of correct treatment.

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Appendix A. Spirometry Questionnaire

1. Do you have access to a spirometer yes/no
   If yes, type……….How many………
   If no, do you have open access to hospital lung function, without consultant referral?Yes/No
2. How often is the spirometer used to diagnose COPD?
   Every case/Often/Sometimes/Rarely/Never/N/A
3. Who uses the spirometer?
   Practice Nurse/GP/Other (specify)………………./
   N/A
These questions are directed at the main user
4. How confident are you with using equipment, including when to calibrate and informing patient of the technique?
   Happy/limited confidence/Not confident/other-
   ………………………………..

5. How confident are you of interpreting results, diagnosing respiratory disorders and initiating treatment based on results?
   Happy/limited confidence/Not confident/other-
   ………………………………..

6. How much training have you had in total and who by?
   (a) Hours on spirometry training
   ………………………………..
   Who by:- Hospital initiated/Specific course/Drug company initiative/Other…………………
   (b) Hours interpretation
   ………………………………..
   Who by:- Hospital initiated/Specific course/Drug company initiative/Other…………………

7. Size of practice?…………………..patients, …………..WTE partners

8. Are you able to give an estimate of number of COPD patients you have…………………..

9. Roughly how many have been confirmed by spirometry?……………………………..

Thank you for your help. If you would like to know results of this review, please insert e-mail address here…………………..

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References