6 Diagnosing COPD

6.1 Introduction

The diagnosis of COPD depends on thinking of it as a cause of breathlessness or cough. The diagnosis is suspected on the basis of symptoms and signs and supported by spirometry. Spirometry can be used to assess the severity of airflow limitation and together with other investigations it can help predict the prognosis. The principal differential diagnosis is asthma and this can usually be distinguished on clinical grounds.

COPD is a heterogeneous disease that affects different patients in different ways. Assessment of the clinical features that are present in an individual helps guide appropriate management.

6.2 Symptoms

In the early stages COPD may produce minimal or no symptoms[7] and as the disease progresses the symptoms in individual patients vary. **IV**

Individual patients rank the importance of different symptoms differently; however, in general, breathlessness is the symptom which causes them most concern. **IV**

Individual symptoms in isolation are not useful in excluding or making the diagnosis of COPD. **IV**

RECOMMENDATIONS

R1	A diagnosis of COPD should be considered in patients over the age of 35 who have a risk factor (generally smoking) and who present with one or more of the following symptoms: • exertional breathlessness • chronic cough • regular sputum production • frequent winter "bronchitis" • wheeze.	**Grade D**
R2	Patients in whom a diagnosis of COPD is considered should also be asked about the presence of the following factors: • weight loss • effort intolerance • waking at night • ankle swelling • fatigue	**Grade D**

R2

R2 Continued

- occupational hazards
- chest pain
- haemoptysis.

  N.B. These last two symptoms are uncommon in COPD and raise the possibility of alternative diagnoses.

R3

One of the primary symptoms of COPD is breathlessness. The MRC dyspnoea scale (see table 3) should be used to grade the breathlessness according to the level of exertion required to elicit it.

Grade D

Table 3 MRC dyspnoea scale

Grade	Degree of breathlessness related to activities
1	Not troubled by breathlessness except on strenuous exercise
2	Short of breath when hurrying or walking up a slight hill
3	Walks slower than contemporaries on level ground because of breathlessness, or has to stop for breath when walking at own pace
4	Stops for breath after walking about 100m or after a few minutes on level ground
5	Too breathless to leave the house, or breathless when dressing or undressing

Adapted from Fletcher CM, Elmes PC, Fairbairn MB *et al.* (1959) the significance of respiratory symptoms and the diagnosis of chronic bronchitis in a working population. *British Medical Journal* 2:257-66.

6.3 Signs

Individual clinical signs are not helpful in making a diagnosis of COPD and in some patients there may be no abnormal physical signs.

The following signs may be present:

- hyperinflated chest
- wheeze or quiet breath sounds
- purse lip breathing
- use of accessory muscles
- paradoxical movement of lower ribs
- reduced crico-sternal distance
- reduced cardiac dullness on percussion
- peripheral oedema
- cyanosis
- raised JVP
- cachexia.

6.4 Spirometry

Demonstration of the presence of airflow obstruction is critical to making the diagnosis of COPD. Spirometry is the only accurate method of measuring the airflow obstruction in patients with COPD. Peak expiratory flow measurement may significantly underestimate the severity of the airflow limitation. All hospitals have access to spirometry and many primary care practices now have a spirometer.

The values for the forced expiratory volume in 1 second (FEV_1) and forced vital capacity (FVC) must be compared with the predicted normal values which depend on the individual's age, height and sex. Various tables of predicted normal values have been published but the ones most widely used in Europe and most relevant for patients in the UK are those published by the European Coal & Steel Community (ECSC)[20].

▷ GDG consensus statements

Spirometry is fundamental to making a diagnosis of COPD and a confident diagnosis of COPD can only be made with spirometry.	**IV**
A diagnosis of airflow obstruction can be made if the $FEV_1/FVC < 0.7$ (i.e. 70%) and $FEV_1 < 80\%$ predicted.	**IV**
In individual patients peak expiratory flow (PEF) rates have not been validated for the diagnosis of COPD and a normal PEF rate does not exclude significant airflow obstruction[21].	**IV**
Spirometry is a poor predictor of disability and quality of life in COPD[22].	**IV**
Spirometry predicts prognosis in COPD[23;24].	**IV**
Spirometry contributes to the assessment of the severity of COPD.	**IV**
Spirometry alone cannot separate asthma from COPD.	**IV**
Changes in the flow volume loop may give additional information about mild airflow obstruction.	**IV**
Measurement of the slow vital capacity may allow the assessment of airflow obstruction in patients who are unable to perform a forced manoeuvre to full exhalation.	**IV**

RECOMMENDATIONS

R4	Spirometry should be performed: • at the time of diagnosis • to reconsider the diagnosis, if patients show an exceptionally good response to treatment.	**Grade D**
R5	All health professionals managing patients with COPD should have access to spirometry and be competent in the interpretation of the results.	**Grade D**

R6	Spirometry can be performed by any health care worker who has undergone appropriate training and who keeps his or her skills up to date.	**Grade D**
R7	Spirometry services should be supported by quality control processes.	**Grade D**
R8	It is recommended that ERS 1993[20] reference values are used but it is recognised that these values may lead to under-diagnosis in the elderly and are not applicable in black and Asian populations.	**Grade D**

6.5 Differential diagnosis

None of the symptoms discussed above are specific to COPD, and several other disorders may present with similar symptoms, signs and spirometry results (table 4). As well as mimicking COPD these conditions may also coexist in a patient with COPD.

Table 4 Conditions presenting with similar symptoms

Common	Less common
asthma	obliterative bronchiolitis
bronchiectasis	bronchopulmonary dysplasia
congestive cardiac failure	
carcinoma of the bronchus	

N.B. Elderly patients are particularly likely to have a number of concomitant medical problems.

6.6 Further investigations

As well as spirometry a number of other investigations are helpful in the initial assessment of patients at the time of diagnosis. Further investigations are also indicated in selected patients depending on the clinical findings.

RECOMMENDATIONS

R9	At the time of their initial diagnostic evaluation, in addition to spirometry all patients should have: • a chest radiograph to exclude other pathologies • a full blood count to identify anaemia or polycythaemia • body mass index calculated.	**Grade D**
R10	Additional investigations should be performed to aid management in some circumstances (see table 5).	**Grade D**

Table 5 Additional investigations

Investigation	Role
Serial domiciliary peak flow measurements	To exclude asthma if diagnostic doubt remains
Alpha-1 antitrypsin	If early onset, minimal smoking history or family history
Transfer factor for carbon monoxide (T_LCO)	To investigate symptoms that seem disproportionate to the spirometric impairment
CT scan of the thorax	To investigate symptoms that seem disproportionate to the spirometric impairment. To investigate abnormalities seen on a chest radiograph To assess suitability for surgery
ECG	To assess cardiac status if features of cor pulmonale
Echocardiogram	To assess cardiac status if features of cor pulmonale
Pulse oximetry	To assess need for oxygen therapy. If cyanosis, or cor pulmonale present, or if FEV_1 < 50% predicted.
Sputum culture	To identify organisms if sputum is persistently present and purulent

R11 Patients identified as having alpha-1 antitrypsin deficiency should be offered the opportunity to be referred to a specialist centre to discuss the clinical management of this condition. **Grade D**

6.7 Reversibility testing

COPD is defined by the presence of airflow limitation that is "not fully reversible and does not change markedly over several months" (See section 1.1). The GDG is aware that in the past there have been concerns about both the under and over diagnosis of COPD in the absence of an objective diagnostic test. Traditionally measurement of the degree of reversibility using bronchodilators or corticosteroids has been used to confirm the diagnosis and in particular to try to separate patients with asthma from those with COPD.

There are many difficulties with this approach. The degree of reversibility that has been regarded as significant was arbitrarily defined and varied from 10% to 20% in different settings. To overcome spurious results in patients with a low FEV_1 a minimum absolute value for the increase (e.g.200 ml) has also been recommended. In practice, there is considerable variability in the change in FEV_1 in response to the same stimulus from day to day. This makes it virtually impossible to interpret the response to an individual reversibility test unless the response is very large (e.g. an increase in FEV_1 of more than 400 ml).

Reversibility testing was promoted in previous national and international guidelines [BTS[25] & GOLD[26]], but is not recommended in the latest guidelines produced jointly by the American Thoracic Society and the European Respiratory Society (as yet unpublished but presented orally at the European Respiratory Society meeting in Vienna 2003).

The BTS/SIGN[27] guidelines on the management of asthma recommend that objective test are used "to try to" confirm the diagnosis. In this section they discuss the fact that significant variability in PEF can be used to identify asthma and suggest that a 20% or greater variability in amplitude is highly suggestive. However, they highlight that many patients will show less variability than this and they conclude that the test is "reasonably specific but insensitive". The guidelines also mention that increases of 15% or 200ml in FEV_1 after inhalation of short-acting $beta_2$-agonists or oral prednisolone can also be seen in asthma, but these guidelines do not deal specifically with the differentiation of asthma from COPD.

In most cases the diagnosis of COPD is suggested by the combination of the clinical history, signs and baseline spirometry. Reversibility testing does not add any additional information. It is also generally possible to identify patients who have asthma rather than COPD on the basis of the clinical picture and again reversibility testing does not add additional information.

Reversibility testing has also been advocated as a means of identifying the most appropriate therapies for individual patients. There is now evidence that the clinical response to bronchodilators or inhaled corticosteroids cannot be predicted by response to a reversibility test.

▷ Evidence statements

There is considerable variation in the magnitude of change in FEV_1 following inhalation of a bronchodilator between individuals and within individuals tested on different days [28;29]. **IIb**

A number of different methods for assessing the response to bronchodilators have been proposed [30-33]. **IIb, IIb, Ib, IIb**

A change in FEV_1 of at least 160 ml is required to exclude changes within the natural variability in FEV_1 in people with obstructive ventilatory defects [34]. **IIb**

A study of patients with fixed airflow obstruction diagnosed as having COPD or asthma on the basis of the clinical history[35] has shown that the clinical diagnosis was correct as assessed by the basis of the pattern of inflammation seen on bronchial biopsies and the differential cell counts in induced sputum findings. **III**

Bronchodilator tests performed with different inspiratory manoeuvres before and after bronchodilator administration provide differing results [36]. **IIb**

The response to a short course of oral steroids does not predict the response to long-term therapy [37]. **Ib**

RECOMMENDATIONS

R12 In most patients, routine spirometric reversibility testing is not necessary as a part of the diagnostic process or to plan initial therapy with bronchodilators or corticosteroids. It may be unhelpful or misleading because: **Grade D**

- repeated FEV_1 measurements can show small spontaneous fluctuations **Grade B**
- the results of a reversibility test performed on different occasions can be inconsistent and not reproducible **Grade B**
- over-reliance on a single reversibility test may be misleading unless the change in FEV_1 is greater than 400ml **Grade B**
- the definition of the magnitude of a significant change is purely arbitrary **Grade B**
- response to long-term therapy is not predicted by acute reversibility testing. **Grade A**

R13 COPD and asthma are frequently distinguishable on the basis of history (and examination) in untreated patients presenting for the first time. Features from the history and examination (such as those listed in table 6) should be used to differentiate COPD from asthma whenever possible. **Grade D**

Table 6 Clinical features differentiating COPD & asthma

	COPD	Asthma
Smoker or ex-smoker	Nearly all	Possibly
Symptoms under age 35	Rare	Often
Chronic productive cough	Common	Uncommon
Breathlessness	Persistent and progressive	Variable
Night time waking with breathlessness and or wheeze	Uncommon	Common
Significant diurnal or day to day variability of symptoms	Uncommon	Common

R14 Longitudinal observation of patients (whether using spirometry, peak flow or symptoms) should also be used to help differentiate COPD from asthma. **Grade D**

R15 To help resolve cases where diagnostic doubt remains, or both COPD and asthma are present, the following findings should be used to help identify asthma: **Grade D**

- a large (>400ml) response to bronchodilators
- a large (>400ml) response to 30mg oral prednisolone daily for 2 weeks
- serial peak flow measurements showing 20% or greater diurnal or day-to-day variability.

Clinically significant COPD is not present if the FEV_1 and FEV_1/FVC ratio return to normal with drug therapy

R16 If diagnostic uncertainty remains, referral for more detailed investigations, including imaging and, measurement of T_LCO, should be considered. **Grade D**

R17	If patients report a marked improvement in symptoms in response to inhaled therapy, the diagnosis of COPD should be reconsidered.	**Grade D**

6.8 Assessment of severity

COPD is heterogeneous, so no single measure can give an adequate assessment of the true severity of the disease in an individual patient. Severity assessment is, nevertheless, important because it has implications for therapy and relates to prognosis.

Other guidelines have used spirometry to classify the severity of the disease, but using spirometry alone may underestimate the impact of the disease in some patients and overestimate it in others. Nevertheless, spirometry can be used to assess the severity of *airflow obstruction* and can be used to guide therapy and predict prognosis. Different thresholds for defining mild, moderate and severe disease have been recommended. It is recommended that thresholds of 50% and 30% are used to define the boundaries as these have implications both for therapy and prognosis and harmonise with the values recommended in the GOLD[38] and the forthcoming ATS/ERS guidelines.

BMI and exercise capacity also reflect the impact of the disease in an individual and predict prognosis.

▷ GDG consensus statements

Currently there are no validated severity assessment tools that incorporate the variables quoted above. **IV**

RECOMMENDATIONS

R18	Mild airflow obstruction can be associated with significant disability in patients with COPD. A true assessment of severity should include assessment of the degree of airflow obstruction and disability, the frequency of exacerbations and the following known prognostic factors: • FEV_1 • T_LCO • breathlessness (MRC scale) • health status • exercise capacity • body mass index (BMI) • partial pressure of oxygen in arterial blood (Pa_{O_2}) • cor pulmonale.	**Grade D**

R19 The severity of airflow obstruction should be assessed according to the reduction in FEV_1 as shown in table 7. **Grade D**

Table 7 Assessment of severity of airflow obstruction according to FEV_1 as a percentage of the predicted value

Severity	FEV_1
Mild airflow obstruction	50-80% predicted
Moderate airflow obstruction	30-49% predicted
Severe airflow obstruction	<30% predicted

6.9 Identification of early disease

In the early stages airflow limitation may be present without producing symptoms. Even if it does produce symptoms, such as breathlessness on exertion or chronic cough, these may not be recognised as being abnormal by the individual. Smoking cessation has the most to offer such patients as it slows the rate of decline in lung function.

See section 2.4.1. for the methodology underpinning the evidence statements.

▷ Evidence statements

COPD can be present in the absence of symptoms[7]. **III**

COPD can be detected by opportunistic case finding in primary care [3;39] and in patients aged 65 and over discharged from hospital. **III**

Opportunistic case finding has a high uptake, reaches most of the target group and has a high yield[3]. **III**

In a study of opportunistic case finding Van Schayck et al found that 27% of patients who were aged over 35 years, were current or ex-smokers and had a chronic cough had reduced FEV_1 [40]. **III**

Knowledge of abnormal lung function as part of a motivational package, significantly affects the success of smoking cessation therapy [41;42]. **Ib**

▷ GDG consensus statements

Opportunistic case finding should be based on the presence of risk factors (age and smoking) and symptoms. The diagnosis should be confirmed using spirometry. **IV**

▷ Health economics

The GDG was interested in the cost effectiveness of opportunistic case finding using spirometry linked to smoking cessation therapy. They were interested in whether the extra resources involved in testing for airflow obstruction and the subsequent intervention of smoking cessation was worth the additional expected benefits. A simple cost effectiveness model was therefore built to look at this issue. This is discussed in detail in Appendix B.

In summary, the model showed that opportunistic case finding in primary care is a relatively cost effective strategy. Key parameters are the prevalence of undetected COPD and the smoking cessation success rate. It should be noted that the model is quite sensitive to some of the parameters and the results must be interpreted with this in mind.

RECOMMENDATIONS

R20	Spirometry should be performed in patients who are over 35, current or ex-smokers, and have a chronic cough.	**Grade D**
R21	Spirometry should be considered in patients with chronic bronchitis. A significant proportion of these will go on to develop airflow limitation[43].	**Grade B**

6.10 Referral for specialist advice

A specialist opinion may be helpful at any stage of the disease. Referral may be to establish the diagnosis, to exclude other pathology, to reassure the patient, to reinforce the need to stop smoking, to optimise treatment, or to assess the need for the more complex and expensive therapies appropriate to severe COPD. The principal reasons are based upon original work from the BTS Statement [44] and have been augmented with consensus from the COPD Guideline Development Group. See section 2.4.1. for the methodology underpinning this section. The reasons for referral for specialist advice are summarised in table 8.

RECOMMENDATIONS

R22 It is recommended that referrals for specialist advice are made when clinically indicated. Referral may be appropriate at all stages of the disease and not solely in the most severely disabled patients (see table 8). **Grade D**

Table 8 Reasons for referral include

Reason	Purpose
There is diagnostic uncertainty	Confirm diagnosis and optimise therapy
Suspected severe COPD	Confirm diagnosis and optimise therapy
The patient requests a second opinion	Confirm diagnosis and optimise therapy
Onset of cor pulmonale	Confirm diagnosis and optimise therapy
Assessment for oxygen therapy	Optimise therapy and measure blood gases
Assessment for long- term nebuliser therapy	Optimise therapy and exclude inappropriate prescriptions
Assessment for oral corticosteroid therapy	Justify need for long-term treatment or supervise withdrawal
Bullous lung disease	Identify candidates for surgery
A rapid decline in FEV_1	Encourage early intervention
Assessment for pulmonary rehabilitation	Identify candidates for pulmonary rehabilitation
Assessment for lung volume reduction surgery	Identify candidates for surgery
Assessment for lung transplantation	Identify candidates for surgery
Dysfunctional breathing	Confirm diagnosis, optimise pharmacotherapy and access other therapists
Aged under 40 years or a family history of $alpha_1$-antitrypsin deficiency	Identify $alpha_1$-antitrypsin deficiency, consider therapy and screen family
Uncertain diagnosis	Make a diagnosis
Symptoms disproportionate to lung function deficit	Look for other explanations
Frequent infections	Exclude bronchiectasis
Haemoptysis	Exclude carcinoma of the bronchus

R23 Patients who are referred do not always have to be seen by a respiratory physician. In some cases they may be seen by members of the COPD team who have appropriate training and expertise. **Grade D**

Diagnosing COPD

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