The burden of chronic obstructive pulmonary disease

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Abstract Chronic obstructive pulmonary disease (COPD) is a disease state characterized by chronic airflow limitation that is not fully reversible, with a precise definition varying between different management guidelines. The burden of COPD is considerable from all relevant viewpoints. From the perspective of society, the mortality is already considerable, and it is likely to increase from the sixth to the third most common cause of death worldwide by 2020. From the patient’s perspective, COPD is responsible for disability that restricts many everyday activities, such as walking up stairs. The burden of COPD on physicians includes increasing consultations for the condition. From the perspective of healthcare payers, COPD represents an increasing burden, primarily due to the costs incurred when exacerbations require hospital treatment.

Despite this considerable burden, there are many signs that the impact of COPD is not recognized. Research on COPD is currently underfunded in relation to the impact of the disease; patients only present late with symptoms; physicians may fail to diagnose the condition and healthcare payers may be failing to support treatment approaches that could reduce the number of costly hospital exacerbations. Reasons for this overall poor recognition of the burden of COPD include lack of recognition of the disease, difficulties in diagnosis, poor knowledge of COPD and nihilistic attitudes towards the condition and its treatment.

Awareness of COPD could be improved with education of the public and healthcare professionals. Long-term epidemiological studies showing the impact on morbidity and mortality of different treatment approaches would also influence the setting of priorities by healthcare payers.

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to inhalation of noxious particles or gases (1). However, COPD is not a disease that can be readily diagnosed since airflow limitation must be measured using spirometry. Diagnosis of COPD is further complicated by the discrepancy frequently observed between symptoms and the degree of airflow limitation, and by the need to differentiate from asthma.

The lung function definition of airflow limitation in COPD varies according to different guidelines (Table 1). These factors complicate the study of COPD epidemiology, as well as the assessment of the burden of the disease.

This paper examines the burden of COPD from the perspective of society, the patient, the physician managing the disease, and the healthcare payer. Although the burden is considerable from all these perspectives, attitudes towards the disease seem to prevent appropriate actions being taken to address the problems caused. The attitudes contributing to lack of appreciation of the impact of COPD are also considered, together with future actions that could be taken to address these issues.

BURDEN OF COPD FROM THE PERSPECTIVE OF SOCIETY

World prevalence of COPD is estimated at 9.34/1000 among males (all ages) and 7.33/1000 females (all ages) (2). The prevalence of COPD varies in different countries, reflecting previous smoking habits among other factors. Estimates for males (all ages) range from 26.20/1000 in China to 2.69/1000 in the Middle Eastern crescent. Even within individual countries, wide variation is seen in COPD prevalence. In Spain, for example, the IBERPOC study of COPD prevalence in subjects aged 40–69 years
of different provinces found a more than three-fold variation (Fig. 1) (3). Not surprisingly, the recorded prevalence of COPD greatly varies with the age group under study, and also varies with the definition used (4).

Mortality from COPD is considerable. In 2000, the World Health Organisation estimated that there were 2.74 million deaths from COPD, worldwide (5). Furthermore, the mortality rate from COPD is increasing. Although in 1990 COPD was ranked sixth in the list of mortality causes worldwide, it is expected to reach third place by 2020 (6). In the U.S.A., the age-adjusted death rate for COPD rose between 1965 and 1998, while it fell for coronary heart disease, stroke and other cardiovascular diseases (Fig. 2) (1,7). In the U.S.A., COPD is now the fourth leading cause of death (behind heart disease, cancer and cerebrovascular disease). Even though COPD is mainly a disease affecting elderly people, there is still a high potential for loss of life-years. Analysis of data from the Flemish regional registration agency in Belgium showed that COPD accounted for more life-years lost among males aged 1–74 years than heart failure (8,9).

Society has to bear the economic impact of COPD, which covers the direct medical costs (considered in more detail below) and the indirect costs arising from the need for disability and pension payments, the consequences of sick leave from employment and the losses arising from early mortality.

### Table 1. Functional definition of COPD in management guidelines

<table>
<thead>
<tr>
<th>Country-Region</th>
<th>Guidelines (ref)</th>
<th>Definition</th>
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<tbody>
<tr>
<td>European Respiratory Society (Eur Respir J 1995; 8:1398–1240)</td>
<td>FEV1/VC &lt; 88% predicted</td>
<td></td>
</tr>
<tr>
<td>Australia and New Zealand (Med J Med Aust 1995; 163:1256–71)</td>
<td>FEV1/FVC &lt; 75%</td>
<td></td>
</tr>
<tr>
<td>GOLD (Am J Respir Crit Care Med 2001; 163:1256–71)</td>
<td>FEV1/FVC &lt; 70%</td>
<td></td>
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<tr>
<td>British Thoracic Society (Thorax 1997; 52: Suppl S51–S528)</td>
<td>FEV1/VC &lt; 70%; FEV1 &lt; 80% predicted</td>
<td></td>
</tr>
<tr>
<td>France (Rev Mal Respir 1997; 14:251–259)</td>
<td>FEV1 &lt; 80% predicted</td>
<td></td>
</tr>
<tr>
<td>Finland (Respir Med 1999; 93:297–332)</td>
<td>FEV1 &lt; 80% predicted</td>
<td></td>
</tr>
<tr>
<td>USA (Am J Respir Crit Care Med 1995; 152:S77–120)</td>
<td>No definition given</td>
<td></td>
</tr>
<tr>
<td>Canada (Can Med Assoc J 1992; 147:420–428)</td>
<td>No definition given</td>
<td></td>
</tr>
<tr>
<td>Switzerland (Schweiz Med Wochenschr 1997; 127:766–782)</td>
<td>No definition given</td>
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FEV1: forced expiratory volume in one second
FVC: forced vital capacity
VC: vital capacity

**Figure 1.** Prevalence of COPD in seven regions of Spain (3).
3.0
1%

FIGURE 2. Rate of changes in adjusted death rates in the U.S.A. between 1965 and 1998 for four major causes of disease and for all other causes grouped (1,7).

BURDEN OF COPD FROM THE PERSPECTIVE OF THE PATIENT

In any assessment of the burden of a disease, the impact on the patient is of primary importance, though it is often forgotten. Understanding this perspective requires careful questioning of patients themselves. A recent large-scale study (Confronting COPD) has tried to assess the burden of COPD on patients in the U.S.A., Canada, U.K., France, Germany, Netherlands, Italy and Spain (10). In this study, over 200,000 households across the eight countries were telephoned at random and approximately 400 people were identified in each country who were aged 45 years or older, had smoked during the last 10 years and had received a diagnosis of COPD, emphysema or chronic bronchitis. These respondents were then asked detailed questions about symptoms and their impact on quality of life. Although lung function testing could not be included to confirm the diagnosis, the results, nevertheless, reveal an interesting picture. The majority of respondents reported frequent troublesome symptoms, with 22–70% of respondents reporting shortness of breath experienced every day or on most days for a 3-month period during the year preceding the research, and 45–67% reporting coughing every day or most days for a similar period (Fig. 3). Respondents also reported severe limitation of effort, with the majority (ranging from 53% in the Netherlands to 73% in the U.S.A.) reporting that they felt breathless when simply walking up stairs. The symptoms of COPD impaired other everyday activities for many respondents (Fig. 4). In other studies using well-validated quality of life questionnaires, such as the St George's Respiratory Questionnaire, COPD has been shown to have a marked adverse impact (11,12).

BURDEN OF COPD FROM THE PERSPECTIVE OF THE PHYSICIAN

Between 1985 and 1995, the number of physician office visits for COPD in the U.S.A. increased from 9.3 million to 16 million. The view of an increasing burden of COPD on physicians was confirmed in the Confronting COPD study, which surveyed 625 primary care physicians and 280 respiratory specialists across eight countries (10). Of the 3265 patients from eight countries responding to this study, 70% reported that consultations for the disease were most frequently with primary care physicians. Most of the physician respondents (ranging from 52% in the U.K. to 85% in the Netherlands, France and Italy) considered that the prevalence of COPD had increased during the last 10 years. In addition to the burden on primary care physicians, COPD also has considerable impact on hospital physicians. For example, the number of hospitalizations for COPD in the U.S.A. was estimated at nearly 500,000 in 1995 (13). Reflecting the increase in prevalence, hospital admissions for COPD are rising, in the U.K. (14) and other countries. The increase in hospital-days is predicted to increase further over the next 20 years or so (15).
Proportion of patients (n=3265) of eight countries reporting symptoms of coughing and shortness of breath present on every or most days during the worst 3 months of the year preceding the survey (10).

Activities reported to be limited by symptoms of COPD (10) in 3265 subjects of eight countries.

**BURDEN OF COPD FROM THE PERSPECTIVE OF THE HEALTHCARE PAYER**

Hospital care is costly, so the burden of hospitalized COPD patients on healthcare payers is considerable. In the U.S.A., for example, the direct medical costs of managing COPD (including hospital stays, outpatient visits and treatments) amounted to $14.7 billion in 1993 (1). Such costs are increasing, as seen for example in Sweden (Fig. 5) (16,17). Although increasing hospitalization costs are the main cause of increased expenditure...
on COPD, other factors are also likely to contribute in the future (Table 2). Furthermore, current initiatives to reduce smoking behaviour will not materially affect the projected increase in costs in the medium-term, due to the long-term nature of the disease (18).

**IS THE BURDEN OF COPD RECOGNIZED?**

Clearly, from the perspectives of society, patients, physicians and healthcare payers, COPD represents a considerable burden that will increase with the ageing population and as the toll from previous use of tobacco becomes manifest. However, there are worrying signs that this burden is not recognized.

### Society

If society recognized the extent of the burden currently imposed by COPD, and predicted for the future, it would be reasonable to expect the condition to feature prominently among the priorities of governments. However, this does not appear to be the case. In the U.K., there are National Service Frameworks highlighting the conditions that are recognized as important priorities for the National Health Service, but although these include heart disease, care of the elderly and smoking cessation, COPD is not specifically targeted. In the U.S.A., National Institutes of Health research funding for COPD is considerably below that which could be predicted from the burden imposed by the disease, in terms of impact on disability-adjusted life years, mortality and years of life lost, while research on acquired immunodeficiency syndrome (AIDS) receives funding out of all proportion to the impact of the disease on these three parameters (Fig. 6) (19).

### Patients

If patients recognized the impact that COPD could have on them, smoking behaviour would be curtailed and symptoms of cough, wheeze, breathlessness and sputum

| Table 2. Factors likely to increase future healthcare costs for COPD |
| --- | --- |
| Factor | Reason for likely cost increase |
| Hospitalization | More patients, more exacerbations managed in hospital which is very costly |
| Drugs | More use of long-acting \( \beta_2 \)-agonists and anticholinergics, inhaled steroids, \( \alpha_1 \)-antitrypsin replacement IV, introduction of new drugs |
| Non-drug treatments | More use of pulmonary rehabilitation, long-term oxygen therapy, nocturnal home ventilation |
| Surgery | Possible use of more lung volume reduction surgery, lung transplantation |
production would be rapidly reported. But this does not happen. While there is wide public recognition of the association between smoking and cancer or heart disease, there is less awareness of the link with COPD. Symptoms of COPD are, correctly, ascribed to the impact of smoking, without appreciating that a defined medical condition has developed. This lack of understanding of COPD results in a delay in presenting to a physician and receiving treatment that could improve symptom control and delay the decline in lung function and quality of life. The Confronting COPD survey confirmed these views, with the finding that the majority of both patients (85% of respondents) and physicians (93% of respondents) thought that patients required more education on the disease (10).

Physicians

If physicians were more aware of the burden of COPD, diagnosis of the disease could occur at an early stage, while treatment of the condition, including smoking cessation, would be intensive to ensure maximum control of symptoms and to maintain quality of life as long as possible. Yet, all the indications are that this does not happen. There may be at least as many patients with undiagnosed COPD as those already diagnosed: where population studies using spirometric assessment have been carried out on smokers, a high proportion has been found to have COPD or impaired lung function that could progress to COPD (20). Patients who smoke and present with regular acute exacerbations of COPD may be treated as if they suffer from repeated respiratory infections, without examination of the underlying disease. When the diagnosis is made, the condition may already be well-advanced with a serious decline in lung function. The general physician’s ability to access and interpret spirometric assessment is limited, impairing the early diagnosis of COPD. Even when diagnosis has been made, prescribing of anything other than flu vaccination is limited (10).

Healthcare payers

If those paying for healthcare for patients with COPD recognized the current and future burden of the disease, they would be taking steps now to encourage smoking cessation and earlier diagnosis. Spirometric screening of all heavy smokers could be used to detect those at an early stage in disease development to target for smoking cessation advice — this could well be more cost-effective than widely accepted screening programmes for cervical and breast cancer. If healthcare payers appreciated the burden of admissions from acute COPD exacerbations, there would be greater support for community-based management programmes and drug treatments that reduce exacerbations. Yet healthcare payers do not appear to be taking such actions, providing mostly little financial support for smoking cessation programmes.
FACTORS LEADING TO POOR RECOGNITION OF THE BURDEN OF COPD

A number of interlinked factors can be identified that contribute to the poor recognition of the burden of COPD.

Poor recognition

Patients fail to recognize the early symptoms of COPD. Symptoms may be attributed to smoking itself, rather than to the early stages of a specific medical condition. This means that they do not present for diagnosis, and fail to receive a medical label for the symptoms they experience. It would be interesting to investigate the relative success of smoking interventions in people during early middle age given a medical diagnosis, compared with those who do not receive a medical label. It could be postulated that the patients given early warning of their condition may take more active steps to stop smoking, in the same way that many patients who suffer an early heart attack make drastic changes to their lifestyle.

Difficulties in diagnosis

In practice, the diagnosis of COPD is essentially one of exclusion - airflow obstruction that is not readily reversible (i.e. asthma), sputum production that is not due to bronchiectasis, symptoms of breathlessness, and more rarely chest pain, that are not due to congestive heart failure or coronary heart disease. Symptoms of COPD bear relatively little relation to the degree of airflow limitation, so that lung function tests are required for diagnosis. Even the various professional organizations do not agree on a specific diagnosis of COPD. It is, therefore, hardly surprising that the diagnosis of COPD presents a barrier to the ready recognition of the disease and, consequently, its burden.

Poor knowledge of the disease

Among the public and healthcare professionals alike, knowledge of COPD is poor. Physicians may be unaware of recent developments regarding pathogenesis and therapy. However, there is still far from complete understanding of the various pathological processes that lead to the various basic features of COPD (e.g. emphysema, small airway disease, chronic mucus hypersecretion). Without a good understanding of the pathophysiology of the disease, physicians may be reluctant to give treatments, even those empirically shown to bring patient benefits.

Nihilistic attitudes towards COPD

A major problem limiting awareness of the burden of COPD is the nihilistic attitude shown towards the condition, among patients, healthcare professionals and healthcare payers alike. There is an overwhelming feeling that the condition is brought on by the actions - mostly smoking - of the patient, and that nothing can be done about the disease, once it develops. Treatments are seen to have limited benefits on symptoms and quality of life, while long-term data showing the impact of treatments on 'hard' endpoints, such as lung function and mortality, are lacking. Since priority setting among healthcare payers inevitably involves consideration of health gain that can be achieved, COPD is given poor consideration.

RAISING AWARENESS OF THE BURDEN OF COPD

If COPD is to be moved up the healthcare agenda, it is important that the extent of the burden it imposes is recognized. This means that the factors impeding recognition of the burden must be addressed. Public education through prolonged media campaigns and via consultations with healthcare professionals is required to ensure earlier presentation with symptoms. Support for professional education is also required, to lower the threshold of suspicion for COPD, and to ensure that diagnosis takes place at the earliest opportunity. Regular spirometric assessments of all smokers over the age of 45 years could be a good way of detecting patients either with early stage COPD or those at risk of developing the disease. Training of healthcare professionals to carry out and interpret spirometry effectively is also required. Research on the underlying pathophysiology of the disease should be widely disseminated, and used to stimulate further research on the condition: this could help in the search for new and innovative therapies.

Other areas requiring further research include long-term epidemiological studies to assess the impact of different treatment approaches on mortality and morbidity; such studies would carry considerable weight with healthcare payers. Demonstrating that the progression of the disease could be affected by the management approach taken would also go a very long way to dispel nihilistic attitudes towards COPD among patients, physicians and healthcare payers alike.

CONCLUSIONS

The available evidence points to the considerable burden of COPD, from the perspectives of society, patients, physicians and healthcare payers. The disability imposed by the condition has a major economic consequence that is likely to increase in the foreseeable future. Despite this, the burden of COPD is not widely recognized, in large part due to poor recognition, diagnosis and knowledge of COPD, and also to nihilistic attitudes towards the condition. Education of both the public and healthcare professionals could help to increase
awareness of the burden of COPD, while further research, particularly long-term epidemiological studies demonstrating the impact of different treatment approaches on mortality, would give healthcare payers the information needed to justify expenditure on the condition.

REFERENCES