Department of Health

Consultation on a Strategy for Services for Chronic Obstructive Pulmonary Disease (COPD) in England

Consultation Impact Assessment

DH INFORMATION READER BOX

Policy **HR/Workforce** **Management** **Planning/** **Clinical**	Estates Commissioning IM&T Finance Social care/partnership working
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Circulation list	Voluntary organisations/NDPBs
Description	The Department of Health is developing a national strategy for COPD services. This consultation draws on evidence from a wide range of reports and stakeholders and the recommendations of an external reference group. It invites everyone to give their views on ideas set out in the document, as well as contribute new ideas to the debate.
Cross reference	N/A
Superseded documents	N/A
Action required	N/A
Timing	Responses should be submitted by the closing date
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For recipient's use	

Consultation on a Strategy for Services for Chronic Obstructive Pulmonary Disease (COPD) in England

Consultation Impact Assessment

Please read this document along with the main *Consultation on a Strategy for Services for Chronic Obstructive Pulmonary Disease in England* and also the *Equality Impact Assessment*.

We would welcome your comments.

Department of Health		Consultation Impact Assessment – Consulting on a Strategy for Services for Chronic Obstructive Pulmonary Disease in England
Stage Consultation	Version 4.5 28/01/2010	Related Publications: COPD Consultation Document

Available to view or download at: www.dh.gov.uk/en/Consultations/DH_659

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What is the problem under consideration? Why is government intervention necessary?

The prevalence and burden of Chronic Obstructive Pulmonary Disease (COPD) in England are unnecessarily high and can be reduced. Mortalit rates for respiratory disease compare unfavourably with the rates in Europe. About 70% of people with COPD are undiagnosed, and those who are identified are generally diagnosed late,with adverse consquences for their quality of life and for public expenditure. In national health service, a COPD strategy is required to provide strategic direction to commissioners, providers, patients and carers.

What are the policy objectives and the intended effects?

We are consulting on how to drive improvement in COPD services by:

- providing a framework against which local services can secure improvements;
- providing advice, guidance and support for commissioners, strategic health authorities and local Authorities in the planning, development and monitoring of services; and
- informing patients' and their families' expectations of health and social care services by providing details of high-quality care.

What policy options have been considered? Please justify any preferred option.

The development of a strategy for services for COPD (which we are now consulting on) identifies two options:

(i) status quo – Do nothing (ii) phased implementation of the COPD strategy

The second option of implementing the COPD strategy taking a phased approach is the preferred option.The strategy will represent a comprehensive approach to COPD services which will maximise potential benefits. The strategy includes options on specific recommendations, where appropriate.

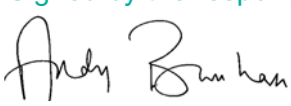
When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

A full impact assessment will accompany the publication of the final strategy.

Ministerial sign-off for consultation stage impact assessments:

I have read the Consultation Impact Assessment and am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options

Signed by the responsible Minister:



Date: 12 February 2010

Policy Option ii: *Phased implenentation of the COPD strategy*

ANNUAL COSTS

One-off (Transition) (total) **£2 million** Years **3**

Average annual cost (excluding one-off)

£56 million

Description and scale of **key monetised costs** by 'main affected groups.' The key costs and cost savings will relate to care plans, self-care and other improvements. -£235 million (PV) will relate to cost savings of care plans and self-care; £400 million for chronic disease management; £263 million for diagnostic review; £86 million for home oxygen; £54 million for confirmatory diagnosis; £39 million for review following exacerbation; and -£34 million for early discharge schemes.

Total Cost (PV) **£461 million**

Other **key non-monetised costs** by 'main affected groups'

ANNUAL BENEFITS

One-off (total) – Years -

Average annual benefit (excluding one-off)

£164 million

Description and scale of **key monetised benefits** by 'main affected groups.' The COPD strategy will release savings and provide benefits across health and social care due to a reduction in avoidable death and long-term disability. They key monetised benefits are £931 million (PV) health benefits from pulmonary rehabilitation and £605 million for home oxygen services.

Total Benefit (PV) **£1,536 million**

Other **key non-monetised benefits** by 'main affected groups.' At this stage, the impact assessment does not include all monetised benefits to individuals or the benefits to the wider economy, but these will be included in the final impact assessment. In addition, there are efficiency gains through prevention of COPD and delayed progression of the disease.

Key assumptions/sensitivities/risks. The strategy may increase demand for COPD services beyond planned activity, which could put pressure on services and/or require additional funding.

Price base year 2009/10	Time period years 10	**Net benefit range** (NPV) **-£235 million to £3,407 million**	**Net benefit** (NPV best estimate) **£1,075 million**

What is the geographic coverage of the policy/option?				England	
On what date will the policy be implemented?				From 2010	
Which organisation(s) will enforce the policy?				CQC, DH	
What is the total annual cost of enforcement for these organisations?				No additional cost	
Does enforcement comply with Hampton principles?				Yes	
Will implementation go beyond minimum EU requirements?				N/A	
What is the value of the proposed offsetting measure per year?				N/A	
What is the value of changes in greenhouse gas emissions?				Negligible	
Will the proposal have a significant impact on competition?				No	
Annual cost (£–£) per organisation (excluding one-off)	Micro -	Small -	Med -	Large	
Are any of these organisations exempt?	No	No	N/A	N/A	

Impact on admin burdens baseline (2005 prices)
Increase of £ Decrease of £ **Net impact** **£** (Increase - decrease)

Key: **Annual cost: constant prices** **(N)PV = (net) present value**

Contents

Chapter 1: Evidence base

Introduction

1. This consultation impact assessment sets out the major costs and benefits that may be associated with the national strategy for chronic obstructive pulmonary disease (COPD). It describes in detail the problem under consideration and why it is necessary for the Government to intervene. The document describes the policy objectives and their intended effects.

2. Two options have been identified:

   - Status quo – do nothing
   - Phased implementation of the COPD strategy.

3. This document outlines the costs and benefits associated with each element of the proposals set out in the strategy, and describes the assumptions that have been made in the calculations. For more detailed discussion of how these different elements fit overall, please see the main consultation document.

4. The costs and benefits outlined in this document are preliminary and will be refined following the consultation process being undertaken in February and March 2010.

5. At this stage, the calculations include the costs and benefits (savings) within the health and social care system, and some monetised benefits to individuals; they do not include all benefits to individuals or the benefits to the wider economy. As we refine the calculations for the final impact assessment, we will include the wider benefits, in order to reflect the impact of the strategy more comprehensively.

6. During the consultation period, the potential administrative burdens of the COPD strategy will be considered further, and they will be evaluated in light of the Government's administrative burden reduction strategy.

What is the problem under consideration?

Background – What is COPD?

7. Chronic obstructive pulmonary disease (COPD) is an umbrella term adopted across the world in the early 1960s to describe a group of conditions that may be better known by the general public as chronic bronchitis or emphysema. COPD describes lung damage that is gradual in onset and that results in progressive airflow limitation. This lung damage, when fully established, is irreversible and, if it is not identified and treated early, leads to disability and eventually death. The greatest cause of COPD is smoking. Other factors include workplace exposure, genetic make-up and general environmental pollution.

8. The main symptoms of COPD are shortness of breath and reduced exercise ability, together with a cough and production of phlegm, which may get worse at certain times of the year. Further information on COPD, its prevalence and its national impact is provided in the consultation document.

9. Approximately 835,000 people in England have been diagnosed with COPD; however, we estimate that around 3.2 million people have the disease.

10. COPD causes more than 25,000 deaths a year in England and Wales. Data from the World Health Organization (WHO) shows that death rates from diseases of the respiratory system in the UK are higher than both the European average and the European Union (EU) average.

11. There has been a growing recognition in England of respiratory disease as a challenge to public services. In 2001, the British Thoracic Society report *Burden of Lung Disease*[1] was one of the first documents to point out the high levels of respiratory disease in this country and its potential impact.

12. The British Lung Foundation, which has long been campaigning for people with COPD, recently launched a campaign to help find the 'missing millions' with COPD and called on government to make COPD a national priority.

13. The Chief Medical Officer focused on smoking in his annual report for 2002 and 2003. In his 2004 annual report, in the chapter titled 'It takes your breath away'[2] he made a number of recommendations, including the need for a more accurate diagnosis (through an improvement in the standards of spirometry) and more structured care for people with COPD. At the same time he also commissioned a strategic scoping review of lung and respiratory disease. This then led to the decision to take national action on these conditions.

14. The NHS already has some guidance available through the *National Service Framework for Long-term Conditions* (2005).[3] This sets out a range of quality requirements and key priorities that can be applied to people with COPD and other respiratory conditions. However, as a 2006 report by the Healthcare Commission, *Clearing the air*,[4] highlighted, there remained a need for primary care trusts (PCTs) and the NHS in general to:

- improve diagnosis for COPD – an estimated 2 million people with COPD remain undiagnosed and there are also significant numbers of misdiagnoses;
- develop structured care appropriate to people's needs, focusing on accurate and earlier diagnosis;
- help people manage their condition themselves by way of structured exercise and education, which have been shown to have a direct impact on people's lives;
- reduce the number of people admitted to hospital. Between 1991 and 2001, age-adjusted rates of admission for COPD rose by 50%, and rates of readmission vary by up to five times in different parts of England;
- address the poor prognosis for people with COPD, as on average 15% of those admitted to hospital with COPD die within three months, and around a quarter will die within a year of admission; and
- improve access to end-of-life care for people with COPD.

15. COPD is not curable, but it is treatable, and can be managed to minimise the burden it imposes. This burden falls not only on the individual, but also on their families and on society as a whole, through the demands placed on public resources. The earlier COPD is identified, the better the outcome for all.

Why is government intervention necessary?

16. The public expects appropriate, integrated services planned and delivered around individual needs, from diagnosis to end-of-life. This strategy reviews the case for change and describes the good practice that is already taking place in the NHS to deliver good COPD services.

17. It does not set national targets or milestones, but points out where we expect the NHS to realise efficiency savings in its efforts to improve services, as well as where we expect investment to achieve significant returns.

18. Nevertheless, the Department of Health also has a role to play by developing tools, harnessing expertise and giving advice, where appropriate, on wider policy contexts. For this reason, the strategy also describes how the Department will take action to support the improvement of services for people with COPD.

19. Alongside the development of the draft strategy, the Department of Health has undertaken a series of measures designed to promote improvements in COPD services. This includes making recommendations on how the Quality and Outcomes Framework (payment mechanism for general practitioners) should be changed to align with the recommendations in the national strategy, piloting Patient–Reported Outcome Measures (PROMs) and programmes of integrated care, and also supporting professional and voluntary organisations to help develop services for people with COPD. We are also supporting the infrastructure to help drive forward the implementation of the strategy at a local level, working with the strategic health authorities (SHAs) and NHS Improvement.

20. Further advances can only be made through a sustained programme supported by the Department of Health. There are a number of areas where COPD services are still underperforming, and action must be taken to address the issues and promote new ways of working. The national strategy for COPD will be a necessary step in improving COPD services across England.

Policy objectives and intended effects

21. When published, the national strategy for COPD is intended to:

    - provide a guide on the provision of high-quality health and social care services to healthcare professionals and members of the public, including those diagnosed with COPD;
    - advise how local communities can prevent people from getting COPD, understand the risks of having poor lung health, secure improvements to the identification, diagnosis and care of people with the disease, and reduce health inequalities;
    - support people with COPD – and their carers – by offering practical advice and education on management of their disease. Our aim is to ensure that everyone diagnosed with COPD receives equitable, responsive, high-quality and effective provision of health and social care services from the right person, at the right time, in the right place; and
    - provide advice and support for commissioners, hospitals, general practice, PCTs and SHAs. All these constituent parts of the NHS must deliver services for COPD while planning, developing and monitoring services against the backdrop of *High Quality Care for All: NHS Next Stage Review Final Report* published in 2008 and the associated work of the SHA clinical pathway groups.

22. The strategy will support existing clinical guidelines from professional organisations, like the British Thoracic Society (BTS), and other national organisations, such as the National Institute for Health and Clinical Excellence (NICE), whose guidelines are currently being updated.

23. The consultation document promotes evidence-based approaches to the management of COPD patients, which will lead to improved clinical outcomes and efficiency savings. Where evidence does not exist, advice is based on expert opinion. It also recommends additional action to help collate further evidence, where appropriate.

24. The strategy essentially has two objectives in mind. The first is to ensure that those people currently diagnosed with COPD have a correct diagnosis, and are then managed proactively, using evidence-based interventions. The second is aimed at prevention, and at finding the 'missing millions' of people who have COPD.

Policy options

25. The consultation will identify two options:

    - Status quo – do nothing
    - Phased implementation of the COPD strategy.

26. The first option (of doing nothing and maintaining the status quo) is not a sustainable course of action. If current inefficiencies in COPD services persist, there will be significant additional cost pressures, due to higher incidence and prevalence of COPD, and sub-optimal patient outcomes, including greater levels of disability and dependence.

27. The second option of implementing the COPD strategy through a phased approach represents a comprehensive approach to COPD services, which will maximise potential benefits. The recommendations represent the best way forward as a whole, based on the current evidence base. The strategy itself will not be prescriptive, and will recognise that local areas will develop their services in line with local circumstances and priorities. The strategy will suggest models for service improvement, but local areas will be free to explore how they can best create high-quality COPD services.

28. Other options that were considered, but rejected, as part of the policy development include:

- Implementing all the recommendations in one tranche at publication. The initial focus of the strategy is to ensure that both primary and secondary care have programmes in place to correctly diagnose people with COPD, and, once they are diagnosed, to make sure there are effective management strategies in place. It was decided that this should be the primary focus of the strategy, before the recommendations set out in Chapter 3 are implemented.
- Introducing specific recommendations on areas such as routine screening of individuals for COPD from birth and the introduction of a lung health check. These were discounted at this stage because of lack of evidence.

Detailed consideration of options

29. The main consultation document is divided into seven broad sections, and under each section there are a number of aspects of the strategy, with specific cost and benefit implications:

- Chapter 1: Setting the scene
- Chapter 2: Prevention and identification
- Chapter 3: Finding the 'missing millions'
- Chapter 4: High-quality care and support
- Chapter 5: End-of-life care
- Chapter 6: Asthma
- Chapter 7: Delivering the strategy

30. The consultation document is not duplicated here. However, the following sections do discuss the key recommendations in the document, including their rationale, and an analysis of costs and benefits.

31. Some aspects of the document are concerned with restating best practice that is already established. For example, the document discusses the provision of pulmonary rehabilitation, using quality assured spirometry for accurate diagnosis and access to non-invasive ventilation when in hospital.

32. Where the document is proposing new developments in service provision, these have been identified for cost–benefit analysis and are detailed below.

33. The following table summarises the costs and benefits of the main recommendations, with resource implications. Cost savings are shown as negative costs.

34. Each of Chapters 2 to 6 has been subdivided into a series of recommendations. In performing the analysis, the recommendations have been considered and costed individually before a final cost range is estimated.

Option 2 – Phased implementation of the COPD strategy

(£ 2009/10)	Constant prices	PV	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	Low PV	High PV
Costs														
7 - Alpha-1-antitrypsin deficiency	11,884	10,167	1,072	1,098	1,124	1,150	1,176	1,201	1,227	1,253	1,278	1,304	25,308	3,166
8 - Confirmatory diagnosis	62,217	54,328	7,650	7,333	7,015	6,698	6,380	6,063	5,745	5,428	5,111	4,793	57,564	54,065
9 - Diagnostic review (net cost)	316,750	262,962	0	0	39,594	39,594	39,594	39,594	39,594	39,594	39,594	39,594	350,616	175,308
12 - Chronic disease management	490,145	399,900	0	0	22,451	45,255	69,097	69,619	70,142	70,666	71,193	71,723	632,930	215,543
14 - Home oxygen therapy (net cost)	103,408	85,716	0	0	12,513	12,688	12,688	12,983	12,987	12,987	13,278	13,282	63,557	112,064
15 - Pulmonary rehabilitation (net cost)	-140,992	-119,119	-4,981	-10,039	-15,331	-15,451	-15,570	-15,688	-15,806	-15,924	-16,042	-16,162	10,232	-500,300
16 - Self-management (including care plans)	-282,000	-234,947	-10,000	-16,000	-21,000	-24,000	-26,000	-37,000	-37,000	-37,000	-37,000	-37,000	-211,453	-258,442
17 - Review after an exacerbation	44,938	38,598	4,340	4,374	4,408	4,443	4,477	4,511	4,545	4,579	4,613	4,647	74,009	14,460
19 - Early discharge scheme	-39,443	-33,879	-3,809	-3,839	-3,869	-3,900	-3,930	-3,959	-3,989	-4,019	-4,049	-4,079	-30,491	-37,266
20 - Non-invasive ventilation	-10,513	-9,030	-1,015	-1,023	-1,031	-1,039	-1,047	-1,055	-1,063	-1,071	-1,079	-1,087	-8,127	-9,933
Total running costs	556,393	454,696	-6,743	-18,097	45,875	65,437	86,865	76,269	76,383	76,493	76,896	77,015	964,146	-231,336
One-off costs														
18 - Ambulance equipment	321	315	160	160	0								347	284
Pilots*	6,000	5,799	2,000	2,000	2,000								5,799	5,799
Total one-off costs	6,321	6,115	2,160	2,160	2,000	0	0	0	0	0	0	0	6,146	6,083
Total costs	**562,714**	**460,811**	**-4,582**	**-15,936**	**47,875**	**65,437**	**86,865**	**76,269**	**76,383**	**76,493**	**76,896**	**77,015**	**970,292**	**-225,252**
Health benefits														
14 - Home oxygen therapy	636,809	604,478	0	0	77,997	77,997	77,997	79,839	79,839	79,839	81,651	81,651	402,985	2,250,108
15 - Pulmonary rehabilitation	1,002,978	931,460	35,432	71,416	109,058	109,912	110,761	111,597	112,436	113,276	114,120	114,970	331,649	931,460
Total health benefit	**1,639,787**	**1,535,938**	**35,432**	**71,416**	**187,055**	**187,909**	**188,758**	**191,436**	**192,275**	**193,114**	**195,772**	**196,621**	**734,634**	**3,181,567**
Total benefits	**1,639,787**	**1,535,938**												
Net		**1,075,127**											**-235,658**	**3,406,820**

* The cost of the pilot programmes will be met from central DH budgets (subject to availability of funds being identified) and will not be a cost imposed on PCTs.
PV = present value

Chapter 2: Prevention and identification

RECOMMENDATION 1: Work should be undertaken locally to identify where prevalence is high, and planned interventions should be developed to encourage behaviour change and help to minimise inequalities.

What is the problem?

35. The national strategy for COPD essentially has two fundamental objectives. The first is to ensure that those people diagnosed with COPD have a correct diagnosis and are managed on a proactive basis, using evidence-based interventions. The second is aimed at prevention and also at finding the 'missing millions' of people who have COPD. This group may have no symptoms and may not be aware that they have the disease. They therefore take no action to change their behaviour or lifestyle, and thus reduce their chances of progressing to a more severe (and costly to the NHS) stage of the disease. We estimate that there are over 3 million people who could have COPD, though only around 835,000 are diagnosed (see Annex 1 for estimates of total prevalence – both diagnosed and undiagnosed).

Recommendation to address the problem

36. Different areas of the country have different prevalence, as COPD is primarily linked to smoking, which is, in turn, linked to social deprivation. PCTs know the health of their local population, and are best placed to work with other stakeholders (e.g. charities) to identify where people with COPD are, and what the best way is to address these people through planned interventions (e.g. a communications campaign based around lung health, or possibly using the media to communicate in a foreign language common to the community).

Assessment of costs and benefits

37. Those people at risk of COPD are identified, and action is taken to change their behaviour, in order to help minimise the risk either that they develop lung disease or, if they have it, to prevent it progressing in severity. The intention is to link in with existing programmes of work that are being undertaken by PCTs at a local level, and so it is not possible to provide detailed costs at this stage.

RECOMMENDATION 2: The importance of lung health should be understood and people should take appropriate action to maintain good lung health.

What is the problem?

38. People are unaware that smoking and exposure to dust and gases at work constitute the biggest risk factors for lung disease. That is why we have over 3 million people with COPD in England. This strategy therefore relies on the notion that interventions should seek to establish a connection between inhalational exposure and poor lung health. Once this connection is established, people can take action to avoid the causes and exacerbating factors of COPD.

Recommendation to address the problem

39. The key to the successful prevention of the disease in its early stages is to improve understanding of it and to encourage behaviour changes among those affected, or those likely to be affected. To succeed, we will need those people at risk of COPD to respond to messages and interventions by:

    - reducing the risks they take and adopting more positive, health-enhancing behaviours; and
    - recognising and responding to the early symptoms of COPD by seeking advice and, where appropriate, a confirmed and accurate diagnosis.

40. This will involve the inclusion in existing communications campaigns (of various stakeholder organisations, such as PCTs and voluntary organisations) of issues aimed at raising awareness of lung health and also at reinforcing the importance of modifying people's behaviour, such as stopping smoking. The Department of Health will also develop communications material and toolkits to help local implementation of communications messages.

Assessment of costs and benefits

41. It is not known how much the NHS and other stakeholder organisations currently spend on existing health promotion or communication activity, but our intention is to modify existing programmes, supported by a number of toolkits and branding developed by the Department of Health. The aim is to develop the toolkits with support from central programme budgets (subject to funding being identified), although exact costs for this work have yet to be determined.

RECOMMENDATION 3: The consequences of exposure to the main risk factors of COPD should be understood and people with early symptoms of lung disease need to be able to recognise their symptoms and seek further investigation.

What is the problem?

42. As stated above, most people are unaware that smoking and exposure to dust and gases at work constitute the biggest risk factors for lung disease. The public also do not generally understand common symptoms of early lung disease, including cough, breathlessness and wheezing. People often ignore the symptoms, or treat them as a normal consequence of smoking or other exposures.

Recommendation to address the problem

43. It is recommended that we help the public understand common symptoms of early lung disease, including cough, breathlessness and wheezing. This will involve linking into existing stakeholder communications campaigns, setting out specific details targeted at those communities (for example miners) that are likely to be exposed to environmental risks (for example coal mines).

Assessment of costs and benefits

44. It is not known how much the NHS and other organisations currently spend on existing health promotion activity, but our intention is to modify existing programmes, supported by the development of toolkits and branding by the Department of Health. The development of the toolkits

will be undertaken with support from central programme budgets, but the exact costs for this work have yet to be quantified.

Risks

45. There is the chance that the COPD strategy will increase awareness of COPD in undiagnosed individuals, so that demand for NHS services (e.g. GPs, diagnostic services, etc.) will be put under pressure. Additional funding would be required to ease such pressures, should they arise.

RECOMMENDATION 4: Further evaluation work should be undertaken on the impact of the use of lung age tests on individuals' motivation for smoking cessation and testing for lung disease as a case-finding approach.

What is the problem?

46. About 85% of those people with COPD have smoked. With around 600,000 people going through NHS stop smoking programmes every year, we estimate that about 100,000 of those potentially have COPD. Furthermore, it is recognised that, for some, it is difficult to quit smoking and to stay quit. An insight we have identified during our work is that people may be inclined to go into smoking cessation programmes if they find that their lung age is significantly more than their actual age.

Recommendation to address the problem

47. Stop smoking services offer potential case-finding opportunities, and we will be exploring the relative benefits, practicality and efficacy of case-finding methods to maximise this potential. We will also be piloting lung age measurement as part of the smoking cessation programme.

Assessment of costs and benefits

48. Some PCTs have used lung age as a motivating factor to help increase quit rates among smokers. However, this is not robust data, and pilots will help provide robust information as to the impact before full implementation.

49. The example below provides an illustration of the costs and benefits of COPD smokers using stop smoking services. The proposed introduction of a lung age check would aim to increase the quit rate, and hence the benefit.

Illustration of smokers with COPD quitting using stop smoking services

50. For background information, the smoking prevalence among the COPD population is estimated at 32%.[5]

51. Evidence suggests that the long-run smoking quit rate for smokers with COPD is higher than the general population's quit rate.[6] The long-run (five-year) smoking quit rate from stop smoking services in the COPD population is estimated to be 17%,[7] whereas in the general population it is estimated at 7%.

Cost(s)

52. The average unit cost of the stop smoking service is estimated at £192 per individual.[8] This cost is a weighted average of the treatments available by the proportion of patients utilising them.

53. Tax revenue is a transfer of benefit from tobacco consumers to the community (the Exchequer). Consumption of tobacco will reduce as people quit smoking, and therefore part of this transfer will cease – there is no offsetting gain to the consumer themselves or to the Exchequer. The lost tax revenue is therefore assumed to be an economic cost. It is assumed that an ex-smoker will spend the money saved from not smoking on other goods and services where VAT applies. Hence, the net impact on VAT revenue is assumed to be neutral.

54. For people diagnosed with COPD the estimated annual tax revenue loss is approximately £2,000 per lifetime quitter. However, this estimate is doubled for the purpose of an impact assessment.[9] It is assumed that, in the absence of a stop smoking intervention, someone with COPD will continue smoking until death.

Health benefit

55. The discounted quality-adjusted life years (QALYs) gained per lifetime quitter is estimated at 3.59.[10] In summary, for people diagnosed with COPD it implies a QALY gain per referral of 0.61 (i.e. only 17% of those referred will quit).

56. In summary, for people diagnosed with COPD, the benefit-to-cost ratio for the stop smoking service is approximately 5:1, and so is deemed a cost-effective intervention. Sensitivity analysis on the quit rate implies that, in order to achieve a benefit-to-cost ratio of 2:1, the quit rate must be greater than 1%. This suggests that stop smoking services for people diagnosed with COPD are cost-effective even at quit rates similar to the general population (7%).

RECOMMENDATION 5: Employers should look to minimise the risks of workforce exposure to known risk factors and work with partners from health and social care to support people with COPD to manage their condition and remain in work.

What is the problem?

57. The majority of those who develop COPD in England will have done so from smoking. Many will be diagnosed while they are still employed. However, data from a number of surveys in industrialised populations estimates that approximately 15% of the attributable risk of lung disease arises from exposure to gases, dusts, vapours and fumes at work. Although none of these studies included a UK population, they are likely to be relevant to the occurrence of lung disease here.

Recommendation to address the problem

58. Where exposure to a substance encountered at work can have an adverse effect on health, there are specific obligations under health and safety law for employers, and those working for them, to prevent that exposure – or, if that is not possible, then properly control it. In some circumstances, employers are obliged to undertake special measures (health surveillance), both to monitor and protect the health of individuals, and to provide feedback on the effectiveness of controls. As part of the strategy, the Department of Health will take action to promote the use of spirometry in at-risk workplaces integrated into occupational health services, improving the prevention and early identification of occupational risk to lung health.

Assessment of costs and benefits

59. We have identified those occupations with a significant occupational risk of COPD. These are shown in Annex 3, together with the source for identifying the risk. They comprise: construction, rubber, plastics, metal, printing, coal mining, cotton and textile, grain workers, quarrying, agricultural and farm workers, mill workers and bakers, exposure to wood dust, smelter workers, coke oven workers, spray painters, and welders.

60. Using the evidence in Annex 3, it is estimated that around 2.5 million to 3.5 million of the England workforce are in occupations deemed a risk for developing COPD. However, it has not been possible to identify data on the number of occupations lacking sufficient protective measures against lung damage.

Chapter 3: Finding the 'missing millions'

RECOMMENDATION 6: Healthcare professionals should understand the risk factors for COPD and offer advice or an appropriate intervention to those who are at risk.

What is the problem?

61. The vast majority of adult diseases have their origins before birth (genetic) or during early childhood (environmental). COPD is no exception, and there is good evidence to suggest that identifying those with known risk factors or evidence of early lung function changes will enable a proactive approach to be taken to both monitoring any changes in lung function/damage and providing appropriate treatment, including during acute episodes of respiratory illness.

62. As stated earlier, a major cause of the development of COPD in adults is smoking. However, there are a range of other risk factors, including occupation, environment and family history. Health events in childhood and genetic susceptibility are also associated with the development of COPD and with the presence of lung damage.[11]

63. It is therefore important that healthcare professionals recognise all the risk factors and improve the recognition of COPD within the community in a cost-effective and efficient manner.

Recommendation to address the problem

64. Deciding whether interventions are needed requires the mechanisms to identify those at risk of developing lung disease (particularly COPD), the establishment of risk registers, and also the use of appropriate diagnostics by skilled and trained healthcare professionals to assess and monitor any lung damage.

65. We will therefore explore the feasibility of establishing an at-risk register of low birth-weight babies, given their potential for developing later respiratory disease; it is these children that are likely to be most at need of lung function testing at a later date. We will also support pilot studies to examine the feasibility of introducing a system to capture information relating to potential risk and to assess lung function and symptoms in children. This will be undertaken with support from central programme budgets, subject to available funding, but the exact costs for this work have yet to be quantified.

66. In order to identify adults with early signs of COPD, we believe there should be greater use of symptom questionnaires and 'case-finding' spirometry (for the purposes of detecting airflow obstruction).

Assessment of costs and benefits

67. We are unable to quantify the costs of the educational element of the recommendation because we are still mapping existing education programmes and the core skills and competencies required to deliver the programme. The work to establish at-risk registers and pilot studies will help determine the full costs and benefits of introducing a system to capture information relating to potential risk and to assess lung function and symptoms in children.

68. For adults, we will undertake further research, using a case-finding approach, which will seek to assess the potential costs and benefits of proactive case-finding. This work is being funded by the Department as part of its programme funding.

RECOMMENDATION 7: In line with World Health Organization (WHO) advice, all people with a diagnosis of COPD and/or history of asthma should be assessed for alpha-1-antitrypsin deficiency.

What is the problem?

69. Alpha-1-antitrypsin is an inhibitor secreted by the liver to protect the lungs against permanent damage. Low levels in the circulation are associated with the development of early-onset emphysema and (in some people) with the development of clinically active liver disease. Cigarette smoking and some occupations lead to amplification of the susceptibility to develop lung damage among those with alpha-1-antitrypsin deficiency, but it is well recognised that even non-smokers with the deficiency can develop significant emphysema, although usually later in life than smokers.

70. The deficiency can run in families, so children can inherit the disease from their parents. However, it is not widely tested at present. If we were to introduce an assessment of people with COPD, we could then also test their primary relatives (mainly children) to identify those at risk of developing COPD, and help them take action to reduce that risk.

Recommendation to address the problem

71. There is some evidence that the early detection of alpha-1-antitrypsin deficiency results in increased awareness of the dangers of smoking and environmental pollution.[12] This suggests that there is potential to encourage the modification of harmful behaviours. However, there is considerable debate in the clinical community as to how best to find people with this genetic defect. One option is to introduce a national screening programme as part of the heel-prick test at birth. However, given the lack of evidence, we are not currently recommending alpha-1-antitrypsin deficiency testing through a national screening programme. We will, however, work to improve the evidence base for future consideration, and will ask the UK National Screening Committee to advise whether there is a case for a national screening programme.

72. While we are undertaking this work, our preferred approach is to focus testing for alpha-1-antitrypsin deficiency on those diagnosed with COPD, in line with advice from the World Health Organization.

Assessment of costs and benefits

Baseline assumptions

73. It is estimated that around 2% (15,000) of people diagnosed with COPD are diagnosed with alpha-1-antitrypsin (AAT) deficiency. However, studies suggest that the underlying prevalence of AAT deficiency in the COPD population is around 10%.[13] This implies that around 62,000 people diagnosed with COPD may have AAT deficiency but are currently undiagnosed.

Assumptions for AAT testing

74. It is assumed that each year around 10% of people diagnosed with COPD (excluding people currently diagnosed with AAT deficiency) will undertake a blood test to determine the levels of AAT, and whether there is a deficiency. Within each COPD cohort, the prevalence of AAT deficiency is assumed to be 10%, which implies around 7,000 new diagnoses of AAT deficiency each year.

75. If someone with COPD is found to have AAT deficiency, then according to WHO advice, their first-degree relatives are offered an AAT assessment. It is assumed that around 75% of first-degree relatives would take-up the offer of an assessment, implying 11,000 AAT deficiency tests per year. The prevalence of AAT in the general population is estimated at 1 in 2,500 (0.04%), which is the assumed prevalence in first-degree relatives. Under these assumptions, a relatively small number (~5) of first-degree relatives would be diagnosed with AAT deficiency each year. This is an underestimate, as prevalence will be higher amongst this group because their COPD-patient relative has AAT deficiency.

76. It is assumed that everyone diagnosed with COPD who undergoes an AAT assessment will have an initial blood test to determine the levels of AAT, and whether there is an AAT deficiency. The unit cost of the test is around £8 (£7–£9). Around 10% of patients will be subject to a further test to determine whether an individual has the relevant genotype. The unit cost of this test is estimated at £40 (£35–£45). This implies an average cost per individual diagnosed with COPD of **£12**.

AAT treatment

77. In general, individuals with AAT deficiency present a normal immunological response, and vaccination is recommended annually against influenza.[14] It is estimated that around 75% of people diagnosed with COPD currently take up the influenza vaccine. The same take-up is assumed for the cohort of people newly diagnosed with AAT deficiency; hence, around 25% of people with AAT deficiency require the vaccine, at a unit cost of **£14**.

78. Augmentation by regular infusions of human alpha-1-antitrypsin is currently available in many countries worldwide. Recent evidence supports the efficacy of such a strategy.[15] However, the therapy should only be introduced for individuals developing progressive COPD despite smoking cessation and optimisation of usual therapies. For the sake of simplicity, it is assumed that the proportion of patients requiring this treatment would be relatively small, and would therefore have a negligible resource implication. This assumption will be explored as part of the COPD consultation.

Benefits

79. The real key to long-term management of AAT deficiency is lifestyle change. The morbidity and mortality among those with the deficiency are amplified by exposure to smoke and other indoor and outdoor air pollution. Therefore, every smoker who is newly diagnosed with AAT deficiency should be offered stop smoking advice and referred to the stop smoking service if necessary. It is estimated that over a ten-year period around 4,500 smokers newly diagnosed with AAT deficiency will quit smoking in the long term (see Recommendation 4 for further details).

Summary of costs

80. In summary, the average annual costs associated with people diagnosed with COPD are overall around £1.1 million, made up of testing for AAT deficiency (around £0.9 million) and treating AAT deficiency (around £0.15 million). The average annual cost associated with first-degree relatives is £0.14 million. The total ten-year (undiscounted) estimated cost of the recommendation is **£11.9 million** (£3.7 million–£29.7 million), with an average annual cost of **£1.2 million**.

RECOMMENDATION 8: A diagnosis of COPD should be confirmed by quality assured spirometry and other investigations appropriate to the individual.

What is the problem?

81. Access to respiratory investigation services varies across the country. In primary care, while spirometry has become more widely available, access to accurate spirometry performed by well-trained staff, competent in lung function measurement and interpretation, has been a concern.[16] The Chief Medical Officer's 2004 annual report stated: 'More primary care staff should be provided with training in the use of spirometry as a tool to detect COPD.'[17] A study of registered COPD patients at primary care practices in Devon[18] found that the final diagnosis for previously diagnosed COPD patients was incorrect in around 20% of cases (see Recommendation 9).

Recommendation to address the problem

82. A diagnosis of COPD is confirmed by quality-assured spirometry and other investigations appropriate to the individual. There are internationally recognised guidelines for performing spirometry and for ensuring that the results are quality-assured and interpreted correctly. We will include these and specifications for achieving accurate spirometric data within a guidance document for the NHS, to be published alongside the strategy.

83. However, it should be noted that spirometry is not the only diagnostic test that may be required at the initial diagnosis stage to ensure that the disease (and its impact) is fully physiologically characterised in an individual. For example, the presence of emphysema is not reflected in spirometric measurements and is likely to have a greater impact on the patient's ability to breathe. Investigations such as radiology using high-resolution computed tomography (HRCT) and a measure of gas transfer or of exercise tolerance may be more informative in the assessment and monitoring of some individuals.[19] For those with coexistent heart failure, an assessment of both lung and cardiac contribution to breathlessness will need to be established through the use of both spirometry and echocardiography. For these reasons, it is important that access to such tests is readily available, so

that there can be a comprehensive evaluation at the point of initial diagnosis. Through pilot projects, we will explore different models of providing a diagnostic hub that would better support primary care healthcare professionals in their assessment.

Assessment of costs and benefits

84. There will be several benefits in improving quality-assured confirmatory diagnoses. Failing to perform accurate spirometry can overestimate the prevalence and severity of COPD and thus lead to wasted resources.[20] Inaccuracies in assessing lung function can also impact on the type of treatment that people receive (with the consequent knock-on effect on cost) – for example, inhaled corticosteroids are only recommended for those with recurrent exacerbations and forced expiratory volume in one second (FEV1) <50% of predicted.[21]

85. At the baseline, it is assumed that individuals with suspected COPD initially undergo a spirometry test, but do not have a confirmatory diagnosis. The COPD strategy recommends that a diagnosis of COPD should be confirmed by a trained and competent healthcare professional and must include spirometry with a flow volume capability performed to national standards and subject to quality-assurance processes. This is the outline of a confirmatory diagnosis.

86. It is assumed that all potential (new) people diagnosed with COPD – an estimated 30,000 people per year,[22] will have a confirmatory diagnosis. The take-up rate of confirmatory diagnosis is assumed to be 100%.

87. A comprehensive range of tests is especially important at the point of diagnosis to confirm or exclude COPD and to establish disease severity and the presence of other coexisting conditions. The assumed tests and estimated unit costs are given in paragraph 90.

88. All individuals have the following assessed:

- Medical Research Council (MRC) dyspnoea scale
- Exacerbation frequency
- Body mass index
- Smoking status
- Estimation of activities of daily living
- Assessment of relevant co-morbidities, including heart failure, osteoporosis and diabetes
- Assessment of lung cancer risk.

89. It is assumed that the assessments, and some tests listed in paragraph 90, will require 15–20 minutes of consultant time and approximately 15–20 minutes of nurse time in total, giving a staff resource unit cost of £38 per assessment.[23]

90. All individuals receive:

- chest radiograph – £19 unit cost[24]
- Full blood count – £3 unit cost[25]
- Oxygen saturation or blood gas status – £4 unit cost[26]
- Post-bronchodilator FEV1 and forced vital capacity (FVC) ratio – £66 unit cost[27]
- Electrocardiogram (ECG) – £33 unit cost[28]

This makes a total of £125.

91. People with suspected moderate, severe or very severe COPD will require an additional full lung function test or HRCT scan.[29]

92. Individuals whose breathlessness is disproportionate to functional abnormality receive an echocardiography to confirm or refute the presence of heart failure. It is assumed, for the purposes of the impact assessment, that the proportion of individuals requiring echocardiography would be small, and hence the resource implications negligible (unit cost of echocardiography is estimated at £70).

93. In summary, the overall cost of a confirmatory diagnosis assessment for a suspected mild COPD patient is estimated at **£163** per patient, and for suspected moderate, severe or very severe COPD patients it is **£274**.

Cost savings

94. It is assumed that an initial spirometry test (in primary care) is conducted without the use of a bronchodilator.[30] As is explained in Annex 1, a diagnosis of COPD without a post-bronchodilator measurement leads to some individuals being misdiagnosed with COPD.

95. There is evidence to suggest that individuals already diagnosed with COPD may have been misdiagnosed on account of the inaccuracy of current diagnostic tests (e.g. pre-bronchodilator measures).[31] See Recommendation 9 for further details on the estimated level of misdiagnosis. It is assumed that a confirmatory diagnosis will more accurately identify individuals with COPD, through the appropriate tests described above, and will therefore stop individuals being newly 'misdiagnosed' with COPD.

96. Reduced misdiagnosis will produce cost savings from a COPD perspective, due to lower resource utilisation, etc.; but a cost will be incurred from the treatment for the new diagnosis.

Summary of costs and savings

97. In summary, the average annual cost of introducing a confirmatory diagnosis for COPD is estimated to be £8 million (£79.7 million over ten years). The estimated cost savings associated with a more accurate diagnosis are around £1.7 million per year (£17.5 million over ten years). The total ten-year (undiscounted) estimated net cost of the recommendation is £62.2 million (£61.9 million–£66 million), with an average annual net cost of £6.2 million.

RECOMMENDATION 9: An assessment of the severity and presence of co-morbid conditions should be made at the point of initial diagnosis, and at least every three years.

What is the problem?

98. An understanding of the degree of spirometric impairment does help in the initial approach to COPD management and can often indicate whether COPD is the principal cause of the person's symptoms or plays only a minor role.

99. People with COPD often also have other disease, including diabetes, asthma or heart disease. It is important that the patient is treated for all the diseases they have, and one way of ensuring this is to assess the patient for these other possible conditions when they first present to the health service with COPD, and regularly thereafter.

Recommendation to address the problem

100. It is recommended by existing international guidelines from the American Thoracic Society and the European Respiratory Society that thorough assessment of the condition of the patient is undertaken when they first present with symptoms of COPD. COPD is a progressive disease, and it is recommended by the External Reference Group that once a diagnosis has been confirmed regular reassessments are needed to monitor the progression of the disease, and to ensure that treatment pathways are appropriate and that people are being given access to appropriate support and advice. We recommend that it is appropriate for a full assessment to be offered every three years, regardless of how well the person seems to be doing.

Assessment of costs and benefits

101. It is assumed that everyone diagnosed with COPD will have a regular review every three years. It is expected that the review process will be spread evenly over the first three years before the second cycle of reviews begins in the fourth year. The assumed annual take-up rate of the regular reviews is 75% (50%–100%). Any newly diagnosed patients are not expected to have a regular review until at least the fourth year (i.e. three years after diagnosis).

102. It is expected that a comprehensive range of investigations and assessment will be performed at each three-yearly review. The tests and assessments are assumed to be the same as is performed for newly diagnosed COPD patients (the exact details are contained in Recommendation 8). In summary, the estimated cost per mild COPD patient is **£163** and for moderate, severe and very severe COPD patients it is **£274**.

103. There is evidence to suggest that individuals already diagnosed with COPD may have been misdiagnosed on account of the inaccuracy of previous diagnostic tests (e.g. pre-bronchodilator measures). Everybody newly diagnosed with COPD will receive high-quality diagnostic tests with greater accuracy for correctly identifying the presence of COPD. Hence, it is assumed that there is minimal misdiagnosis in this group.

104. A study of registered COPD patients at primary care practices in Devon[32] found the final diagnosis for previously diagnosed COPD patients was as shown in the following table.

Final diagnosis	Percentage of total	Final diagnosis for current COPD patients*
COPD	68.5	397,000
COPD with asthma	4.3	25,000
Asthma	6.7	39,000
Restrictive disorder	4.0	23,000
Cardiac	0.3	2,000
Normal	16.2	94,000
Total	**100**	**580,000**

*Assuming a 75% take-up of the regular review.

105. There are few other studies that have examined the current level of misdiagnosis in England. However, it is assumed that broadly similar findings would be obtained across England. Hence, it can be estimated that approximately 160,000 people are currently misdiagnosed with COPD (this excludes individuals with COPD and asthma) in England.

106. The final diagnosis will produce a cost saving from a COPD perspective, due to lower resource utilisation, etc; but a cost will be incurred from the treatment for the new diagnosis. The estimated annual cost and net annual cost per patient for the final diagnosis are given below.

Final diagnosis	Cost of new treatment	Net cost*
COPD	N/A	N/A
COPD with asthma	£251	£251
Asthma**	£314	-£761
Restrictive disorder	–	–
Normal	–	-£121

* The estimated annual cost to the health service of a COPD patient is £1,075. For the normal group, it is assumed they were misdiagnosed as mild COPD patients.

**Department of Health analysis of the average annual cost to the health service of treating asthma. For COPD and asthma patients, it is assumed that 80% of this cost would be incurred due to the overlap of treatment provided.

107. The annual cost (and net cost) per patient for the cardiac group has not been assessed on account of the relatively low expected number of individuals in this group. Individuals diagnosed with restrictive disorder are assumed to have a similar annual cost as when they were treated for COPD, hence there is no additional cost (or cost savings).

Summary of costs and savings

108. In summary, the average annual cost of introducing a diagnostic review for COPD patients is estimated to be £51.3 million (£513 million over ten years). The estimated cost savings associated with a more accurate diagnosis are around £17.8 million per year (£178 million over ten years), with a final diagnosis of COPD and asthma incurring £2.1 million annual cost; asthma £10 million saving; no condition £3.8 million saving. The total ten-year (undiscounted) estimated net cost of the recommendation is **£396 million** (£264 million–£528 million), with an average annual net cost of **£39.6 million**.

Non-monetised benefits

109. It is likely that the introduction of a diagnostic review would help support appropriate management of the disease, ensure that treatment pathways are appropriate and that people are given access to appropriate support and advice. The magnitude of this effect still needs to be quantified. We will be supporting a pilot project to develop and test a model for primary care to both undertake and collect this information.

Risks

110. The current level of misdiagnosis is based on one study,[33] and is applied to the population of England. It could be possible that this study is not representative of the national picture. Hence, there is a risk that the cost savings associated with an accurate diagnosis, and with rectifying misdiagnosis, may be overstated.

RECOMMENDATION 10: Disease registers should be accurate and used to improve COPD outcomes.

What is the problem?

111. Disease registers held by primary care could become a rich source of information if used on a proactive basis and could underpin efforts to improve outcomes for people with COPD. There is good evidence, however, that they are currently far from accurate.[34] In order to better assess their accuracy it is essential to record actual spirometric readings and whether or not they meet national and international standards (i.e. quality assurance). Encouraging frontline staff (e.g. GPs) to maintain accurate disease registers should promote appropriate treatment.

Recommendation to address the problem

112. In order to encourage better use of disease registers, we will be supporting a pilot project to develop and test a template to be used in primary care, which will be funded by the Department of Health.

Assessment of costs and benefits

113. This is not expected to have additional resource implications, but there are anticipated benefits to the ongoing treatment and management of people with COPD, including more accurate drug therapy and better access to non-pharmacological interventions.

RECOMMENDATION 11: Good-quality information should be provided at diagnosis and delivered in a format that any person can understand.

What is the problem?

114. Not everyone who is newly diagnosed with COPD leaves their doctor or consultant fully understanding their condition and how it can be managed. This may be due in part to language difficulties, or to insufficient information being provided by the relevant healthcare professional. Consequently, the patient does not manage their condition as well as they might, leading to treatment not being optimised and to additional costs to the NHS.

Recommendation to address the problem

115. Good-quality information can be delivered by a variety of sources (the hospital, their GP, a pharmacist), by a wide range of providers (the Department of Health, the NHS, charities), in a number of different formats (online, as leaflets). The key elements are that the information is of a high quality, comes from a validated and trusted source, and covers all the issues that are relevant to the patient.

Assessment of costs and benefits

116. There is already extensive material about COPD produced by various organisations, but the material needs to be reviewed and made more extensively available at the point of diagnosis. With the right information at the outset, people are better able to manage their condition.

Risks

117. If current provision of information is significantly below what is expected, this recommendation will potentially increase public awareness of COPD services. An increased demand for GP or hospital treatment could put NHS services under pressure. Additional funding would be required to ease such pressure, should it arise.

Chapter 4: High-quality care and support

RECOMMENDATION 12: Chronic disease management approaches should be adopted in health and social care for all people diagnosed with COPD, irrespective of severity or symptoms.

What is the problem?

118. People with long-term conditions are not managed to an optimum level by the NHS: people are not supported to self-manage; in many areas a comprehensive system to support clinical management does not exist; and people are not managed using clinical guidelines. Quality of life is therefore undermined. Problems with restricted mobility may be compounded by social isolation and the psychological conditions that go with it.

Recommendation to address the problem

119. The central aim of chronic disease management is that interactions between those with COPD and health and social care professionals are productive, and that people are seen as partners in the management of their condition. This means that while health and social care professionals have access to up-to-date information, decision support and the resources needed to deliver care that is of a high quality, people with COPD should also have the information, skills and confidence that they need to make decisions about their health in order to better manage their condition and be motivated to do so.

Assessment of costs and benefits

Baseline assumptions

120. It is estimated that there are around 835,000 people diagnosed with COPD.[35] The Royal College of Physicians (RCP) audit reported that 55% of people diagnosed with COPD have a regular check-up with their GP.[36] However, the regular check-ups are unlikely to be as extensive as the proposed clinical review. Therefore it is assumed that a quarter of the current regular check-ups (–13% in total) meet the requirements of a clinical review. This implies that there are an estimated 670,000 people diagnosed with COPD who are currently not receiving a clinical review.

Intervention assumptions

121. As recommended by National Institute for Health and Clinical Excellence (NICE), as a minimum, those with mild and moderate COPD have their management plans reviewed annually, those with severe/very severe COPD six-monthly, or as clinically indicated.

122. Local decision makers will decide the method by which a clinical review is conducted. For simplicity, it is assumed that people with mild and moderate COPD will have annual reviews conducted by telephone with a respiratory nurse. Each year, 50% of those with severe and very severe COPD are assumed to have one telephone review, with the other 50% having a face-to-face meeting with a respiratory specialist.

123. A telephone review is estimated to take 15 minutes of a respiratory nurse's time (£60/hour) and a face-to-face meeting with a respiratory specialist is estimated to cost £147.[37] The annual unit costs are as follows.

COPD severity	Estimated unit cost
Mild/moderate	£15
Severe/very severe	£80

124. It is assumed that the regular review would have a three-year phased implementation starting from 33% coverage in 2012/13 moving towards 100% coverage by 2014/15.

Summary of costs

125. In summary, the total ten-year (undiscounted) estimated net cost of introducing regular reviews for people diagnosed with COPD is **£490 million** (£264 million–£775 million), with an average annual net cost of **£49 million**.

Non-monetised benefits

126. Introducing regular reviews has been effective in preventing admission to hospital and in reducing healthcare utilisation.

Risks

127. For simplicity, the analysis assumes respiratory nurses conduct telephone reviews. If the entire caseload were treated in this manner there would be a requirement for an additional 1,500 respiratory nurses, approximately ten for each PCT. Hence, additional funding would be required. In practice, other healthcare professionals may perform the review.

RECOMMENDATION 13: All people with COPD should receive evidence-based treatment in a structured medicines management approach. A step-up approach to smoking cessation intervention as part of preventive management strategies should be taken.

What is the problem?

128. This is linked to the previous recommendation, where the more information the patient has, the more likely they are to be able to self-manage their condition. As most COPD is caused by smoking, targeting smoking cessation is an effective way of reducing the risk of more severe disease developing. It can take as many as seven or eight attempts for a smoker to quit, therefore programmes need to consider this and have robust systems to follow up those who have used the service and offer them further help if needed.

Recommendation to address the problem

129. All people with COPD should receive treatment in accordance with existing clinical guidance and based on presenting symptoms, their wishes and the clinical views of healthcare professionals who are looking after them. In all cases of COPD (irrespective of severity), treatment should be optimised to control and/or minimise symptoms to ensure that people living with the disease can play an active

part in everyday life. Stop smoking services should offer a long-term programme that is flexible enough to deal with an individual's needs.

Assessment of costs and benefits

130. As with the treatment of many long-term conditions, medicines bring a number of benefits to people with the disease. The realisation of these benefits, however, and the avoidance of ineffective or harmful medicines, require the appropriate choice and use of medicines by healthcare professionals, people with COPD and their carers. We have not yet been able to quantify the costs of more effective treatment but will do so in the final impact assessment. The health gains achieved by stopping smoking are outlined earlier in the impact assessment.

RECOMMENDATION 14: All people with COPD and hypoxaemia should be clinically assessed for long-term oxygen therapy and reviewed at regular intervals, and existing home oxygen registers should be reviewed.

What is the problem?

131. People with severe COPD can have very low oxygen levels in their blood, and may need assistance with the use of oxygen at home. Recent figures provided to the Department of Health suggest that around 30% of people prescribed oxygen either derive no clinical benefit from it or do not use their oxygen. Once prescribed, there is no requirement to review people's use of home oxygen.

Recommendation to address the problem

132. The Department of Health is currently looking at exactly how home oxygen services should be delivered. We need to ensure that people are properly prescribed oxygen and, once prescribed, that they receive a good quality and effective service that provides value for money. We are therefore recommending the introduction of formalised clinical assessment and review.

Assessment of costs and benefits

Context

133. Currently there is no requirement to have an oxygen assessment carried out before prescription and people's needs for oxygen are not always reviewed. As a result it has been reported that up to 30% of those currently prescribed oxygen at home derive no clinical benefit from it.

Baseline assumptions

134. An estimated 85,000 patients are currently receiving home oxygen therapy (HOT).[38] An estimated 60% (51,000) of current HOT users are people diagnosed with COPD. It is implicitly assumed that these users follow the same distribution of HOT type as the general HOT distribution. Provision and unit cost are broken down by type of oxygen therapy in the following table.

Type of therapy	Proportion of HOT users*	All Patients	Estimated COPD Patients	Annual unit cost**
Short-burst (SBOT)	25%	21,000	13,000	£430
Ambulatory (AO)	4.5%	4,000	3,000	£1,233
Long-term (LTOT)	22%	19,000	11,000	£535
LTOT and AO	32%	27,000	16,000	£1,662
Other (combination of LTOT, AO, SBOT)	16.5%	14,000	8,000	£981–£1,557
TOTAL	**100.0%**	**85,000**	**51,000**	

* BTS Home Oxygen database (2007).
**NERA (February 2007). The Costs and Benefits of Pre-Screening and Clinical Assessment for Home Oxygen Therapy: A Final Report for NHS London.

135. COPD HOT users currently receiving an annual clinical assessment, broken down by type of oxygen therapy.[39]

Type of therapy	Proportion of COPD HOT users	Users
SBOT	47%	6,000
LTOT	56%	6,000
AO	41%	1,000
	TOTAL	**13,000**

136. Hence, it is estimated that approximately 38,000 (51,000 – 13,000) current COPD HOT patients require a clinical assessment. **It should be noted that this impact assessment is focused only on people diagnosed with COPD and COPD HOT users.**

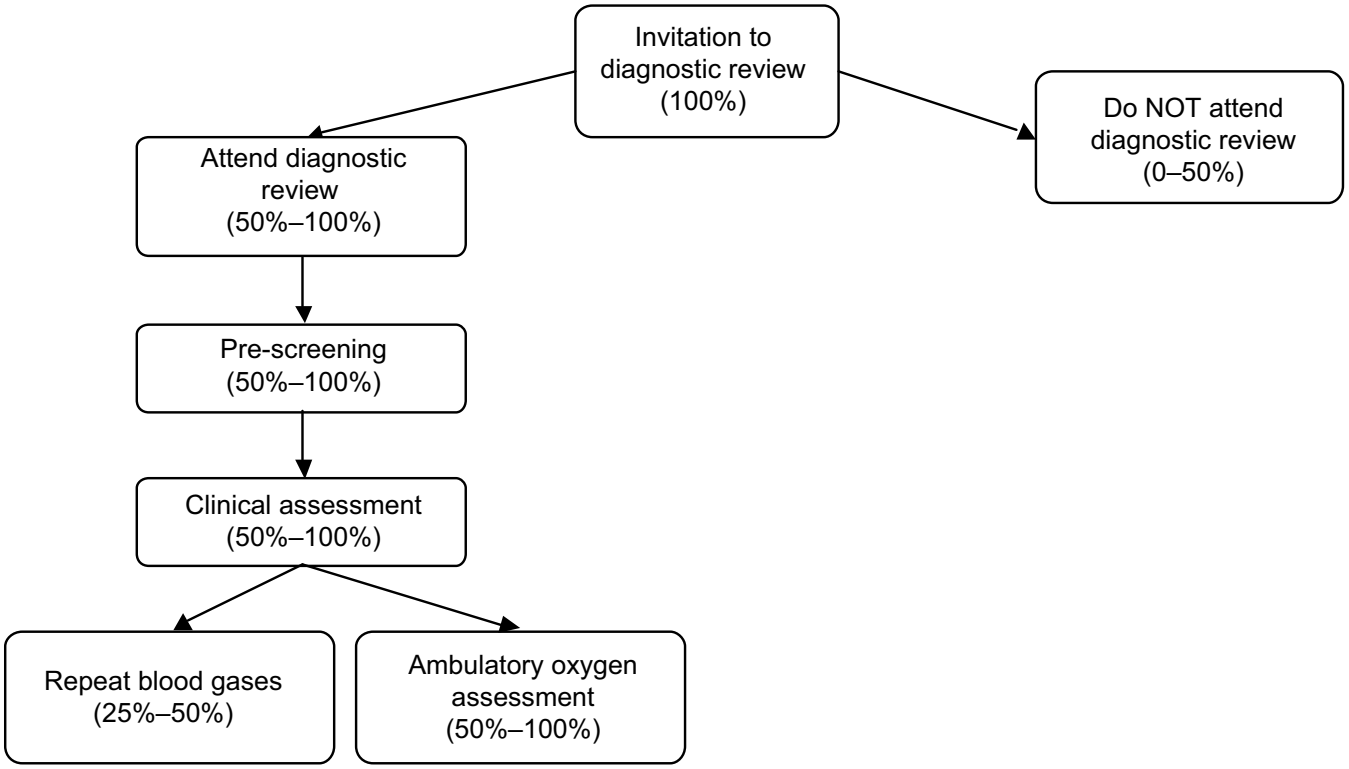
137. It is expected that every COPD patient will undergo a diagnostic review (see Recommendation 9) every three years. As part of this review, individuals will have their need for home oxygen assessed, where appropriate. Therefore, some of the assessments and tests covered in the diagnostic review will overlap with the clinical assessment for HOT. The estimated costs described in this section are resource impacts that are in **addition to the diagnostic review recommendation**.

Intervention – current users

Pre-screening and clinical assessment

138. All current home oxygen users who attend a diagnostic review will undergo pulse oximetry, which is used to indicate whether further clinical assessments are needed. The take-up rate of diagnostic review is assumed to be 75% (50%–100%); hence, it is assumed that 75% of all current home oxygen users attend.

139. The diagram below illustrates the stages all people diagnosed with COPD who use HOT are assumed to follow. The percentages in brackets represent the proportion of all COPD HOT users.



140. A clinical assessment is likely to include a spirometry test, blood gases tests, oxygen saturation tests and a possible chest X-ray.[40] These tests also form part of the requirements of the diagnostic review so the costs have been included in that recommendation. To undertake some of the tests it is assumed that staff resources (30 minutes of a clinical physiologist's time) of **£21** per patient are required. This cost forms part of the additional cost of the HOT clinical assessment.

141. In the context of a HOT assessment, the blood gases test (pulse oximetry) will be repeated in patients detected as having chronic hypoxaemia. The unit cost of the repeat test, which is not included in the diagnostic review, is estimated at **£18**.[41]

142. Furthermore, patients will have their need for AO assessed through a simple exercise test which is conducted several times (e.g. practice, on air, on oxygen). It is estimated that 30 minutes of a clinical physiologist's time is required to undertake this additional assessment at a unit cost of **£21**. It should be noted that all current HOT users are assumed to receive this additional assessment.

143. In summary, the estimated (average) additional total unit cost of a clinical assessment is **£51**.

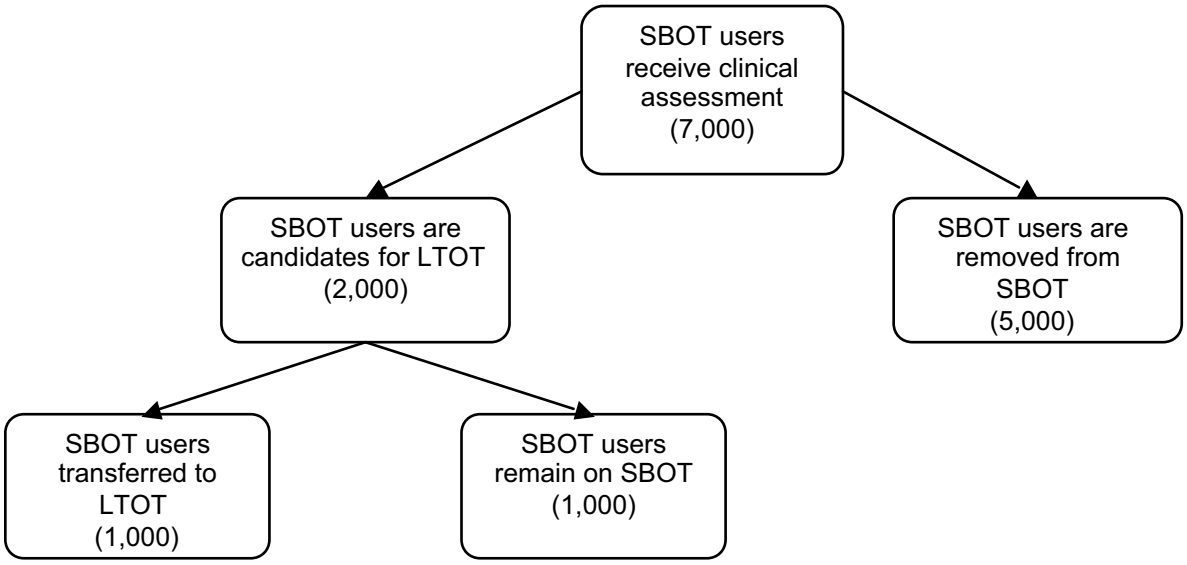
Follow-up assessment

144. For all patients completing a clinical assessment, it is assumed the follow-up assessment take-up rate is 75% (50%–100%). It is estimated that a follow-up assessment requires 30 minutes of a district nurse's time,[42] at a unit cost of **£24**. Where HOT is deemed unnecessary, this further assessment would not be required (i.e. excludes SBOT removed from HOT – see 'Cost savings' below).

Cost savings

145. It is estimated that 75% of SBOT users will be removed from SBOT after a clinical assessment.[43] It should be noted that SBOT patients are assumed to have the same take-up rate of 75% (50%–100%) for the clinical assessment (and diagnostic review) as all current HOT users. It is assumed that SBOT users are 50% into an average duration of HOT usage, three years. Hence, there will be a cost saving per SBOT user removed of **£645**.

146. Furthermore, it is estimated the clinical assessment will reveal that 25% of current SBOT users are candidates for LTOT. It is assumed that half of the candidates will be prescribed LTOT in place of SBOT at an additional annual cost of **£105**, while the other half will remain on SBOT. It should be recognised that while there are 13,000 COPD patients using SBOT, approximately half (6,000) currently receive a clinical assessment. Therefore, the analysis is focused on the additional patients not receiving an assessment at the baseline (7,000). The diagram below illustrates the process for SBOT users over a three-year period (for annual estimates divide figures by 3).



Intervention – new patients

147. It is estimated that 40% of the Global Initiative for Obstructive Lung Disease (GOLD) stage 4 COPD patients should be LTOT users, whereas only an estimated 20% of GOLD stage 4 COPD patients are current LTOT users.[44] Hence, there is unmet need in 20% (30,000) of COPD GOLD stage 4 patients and this group of patients requires a HOT clinical assessment to determine the need for HOT.

Pre-screening and clinical assessment

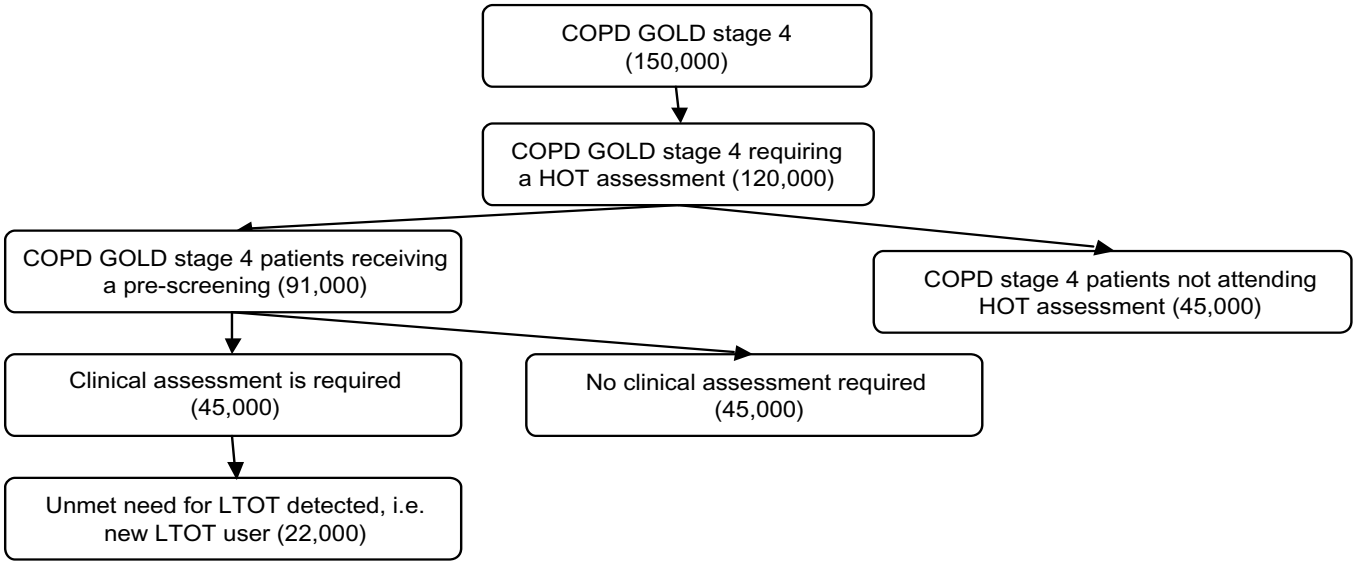
148. It is assumed that all GOLD stage 4 patients (150,000) will undergo a pre-screening assessment to determine their need for a clinical assessment. However, the impact assessment will focus only on the resource impact for current GOLD stage 4 non-LTOT users. Expert opinion suggests that approximately half of GOLD stage 4 patients receiving a pre-screening will require a clinical assessment.

149. The same take-up rate for a HOT assessment is assumed (based on the diagnostic review), i.e. 75% (50%–100%). Similarly, the tests, assessments and unit costs for the pre-screening and clinical assessment are assumed to be the same as those described for existing users.

Follow-up assessment

150. For patients completing a clinical assessment, it is assumed the follow-up assessment take-up rate is 100%. During the first year, new LTOT users are assumed to receive one 45-minute home visit from a district nurse[45] at a total of **£36** per new LTOT user. The following visit is assumed to be a 30-minute home visit from a district nurse at a total cost of **£80** per LTOT user. It is estimated that one additional visit will occur in the first year and one visit in the second year.

151. The diagram below illustrates the process for new LTOT users described above, over a three-year period (for annual estimates divide by 3).



Additional costs

152. New COPD LTOT users are assumed to be users for three years. Hence, the additional (discounted) cost per new LTOT user is £1,550. Note: this excludes the cost of follow-up assessments.

Health benefits

153. Evidence suggests that, compared with a control group, patients receiving LTOT can expect an incremental 0.28 quality-adjusted life year (QALY) gain over a three-year period and an incremental 0.59 QALY gain over a five-year period.[46] Given that this impact assessment analysis assumes an individual will receive HOT for an average of approximately two years, an incremental gain of 0.21 QALY is used for new LTOT users. Using the Department of Health's monetary value of £50,000 per QALY, it implies an estimated monetised health benefit of £10,500 per LTOT user.

Non-monetised benefits

154. For newly identified users it is likely that the provision of HOT would reduce acute exacerbations of patients requiring emergency hospitalisation.[47] The magnitude of this effect still needs to be quantified.

Summary of costs and benefits

Current users

155. In summary, the average annual cost of introducing a HOT review for COPD GOLD stage 4 patients is estimated to be £0.7 million (£6.5 million over ten years). The estimated cost savings associated with better provision of HOT are around £0.8 million per year (£8 million over ten years). The total ten-year (undiscounted) estimated net cost of the recommendation is **–£1.5 million** (–£6.8 million to £9.3 million), with an average annual net cost of **–£0.5 million**.

New users

156. In summary, the average annual cost of introducing a HOT review for COPD stage 4 patients is estimated to be £1.45 million (£15 million over ten years). The estimated cost associated with providing LTOT is around £12 million per year (£120 million over ten years). The total ten-year (undiscounted) estimated net cost of the recommendation is **£132 million** (£87 million–£177 million), with an average annual net cost of **£13.4 million**.

157. The estimated total monetised health benefit of providing LTOT to new COPD users is **£802 million** (£535 million–£2,985 million), which provides a net benefit of **£670 million** (£447 million–£2,800 million).

RECOMMENDATION 15: All people with COPD should be advised to undertake moderate exercise according to their condition. People with functional impairment should be referred for quality assured pulmonary rehabilitation.

What is the problem?

158. People with COPD develop progressive and irreversible airways narrowing that is associated with muscle weakness, causing breathlessness and reduced capacity for activity. This results in respiratory disability, especially in those with more severe disease, and a corresponding increase in dependence on health and social care resources.

159. People with mild COPD are generally not sufficiently disabled by their condition to warrant participation in formal pulmonary rehabilitation programmes (MRC dyspnoea scale grades 1or 2) but are not currently told to take routine exercise. Formal pulmonary rehabilitation programmes are not universally available across England and are not provided by all PCTs.

Recommendation to address the problem

160. People with mild COPD should receive the same physical activity messages as the general population – at least 30 minutes of physical activity, five times a week. This message may need to be tailored to overcome negative expectations about physical activity, including getting out of breath. The Department of Health recently launched a £75 million integrated campaign called Change 4 Life to promote physical activity in the context of the prevention of obesity/overweight.

161. For those with moderate or more advanced COPD, pulmonary rehabilitation is an essential part of the non-pharmacological treatment pathway. Pulmonary rehabilitation refers to a combination of supervised exercise training with a comprehensive education programme and psychological support aimed at changing behaviour. There is very strong evidence that it improves exercise tolerance and health-related quality of life, as well as reducing breathlessness and an individual's use of the healthcare system.[48]

Assessment of costs and benefits

162. The cost of the Change 4 Life programme is not covered in this impact assessment. All costs below relate to the (additional) provision of formal pulmonary rehabilitation.

Context

163. It is necessary to model the additional costs and benefits of the policy proposal and therefore the following is set out:

- assumptions and available data on the current service provision or baseline of pulmonary rehabilitation services for individuals with COPD;
- assumptions made and interpretation of future service provision, as set out in the national strategy for COPD, in terms of costs and benefits; and
- the methodology for estimating the potential additional impact.

Baseline assumptions

164. The national strategy for COPD recommends that all people diagnosed with moderate, severe or very severe COPD should be eligible for pulmonary rehabilitation, which implies around 716,000 (92%) patients.

165. There is limited data on the baseline level of service provision of pulmonary rehabilitation, and there appears to be regional variation. The assumptions about current service provision and usage are taken from RCP audit[49] data on the reported number of eligible patients receiving pulmonary rehabilitation.

Pulmonary rehabilitation provision	Estimated percentage of units (a unit is defined as a hospital that admits acute unselected emergency admissions)
Full provision	58%
Partial provision (i.e. provision for some eligible patients)	32%
No provision	10%

166. It is assumed that there is currently unmet need for pulmonary rehabilitation in 10% of eligible COPD patients (~72,000). Therefore the focus of the cost–benefit analysis is the additional impact of increased pulmonary rehabilitation provision for this group.

Intervention assumptions

167. There is limited evidence on the detailed costs and benefits of pulmonary rehabilitation, but two main papers were used to calculate the impact.[50] The analysis is based largely on the figures quoted in the Griffiths et al. study of 2001, and uprated to 2009 prices. The Griffiths study focuses on pulmonary rehabilitation for people with moderate, severe and very severe COPD, which is in line with the proposed national strategy for COPD.

168. The estimated unit cost of pulmonary rehabilitation is **£990** per patient. It should be recognised that this cost includes staff costs (occupational therapist, consultant, senior physiotherapist, senior dietician, clerical co-ordinator, therapy helper and respiratory nurse specialist), transport costs, equipment, consumables and overhead allowance.

169. Cost savings per patient were derived by comparing the total healthcare costs of individual patients in the pulmonary rehabilitation group (-£2,300) and the control group (-£2,500). The total healthcare costs include the intervention costs, GP home visits, visits to the GP surgery and hospital admissions. The estimated net cost saving per patient receiving pulmonary rehabilitation is **£210**.

170. The Griffiths et al (2001) study also reported the QALY gain of the pulmonary rehabilitation group (0.38) and control group (0.35). This suggests an incremental QALY gain of 0.03 QALYs per pulmonary rehabilitation patient. The Department of Health values a life year at £50,000, which implies a monetised health gain per pulmonary rehabilitation patient of **£1,500**.

171. It assumed that expansion of pulmonary rehabilitation services will be phased over three years, from a 33% expansion in 2010/11, 66% expansion in 2011/12 and 100% in 2012/13.

Summary of costs and benefits

172. In summary, the average annual cost of extending the provision of pulmonary rehabilitation is estimated to be £155 million (£1,553 million over ten years), including the healthcare costs associated with patient service usage. At the baseline (i.e. without pulmonary rehabilitation), the estimated average annual healthcare costs are around £169 million per year (£1,694 million over ten years). This implies a total ten-year (undiscounted) estimated net cost of the recommendation of **–£141 million** (–£592 million–£12 million), with an average annual net cost of **–£12.1 million**.

173. The estimated total monetised health benefit of providing pulmonary rehabilitation to new COPD patients is £1,003 million (£357 million–£1,003 million), which provides a net benefit of **£1,144 million** (£345 million–£1,595 million).

RECOMMENDATION 16: People with COPD should be encouraged to learn how to help manage their condition themselves and how to have positive interactions with healthcare professionals and others about their condition. They should also be encouraged to engage with others who have COPD in order to promote exchanges of information, support and advice.

What is the problem?

174. People with COPD want information, advice, education and support. Many will want to understand their condition in detail. Those who do should be encouraged to take 'ownership' of their condition and thus feel more confident in managing it. The concept that works well in other disease areas is that of the 'expert patient': people have a wealth of educational materials, advice and support that helps them with every aspect of their disease from recognising and acting on symptoms through to developing strategies to deal with the psychological consequences of illness. Other aspects of education and support which are effective but not routinely utilised include the development of personalised care plans (personalised care planning means that people with COPD should be offered a discussion about their condition, what is important to them and what their goals are). They should also be offered information and support for self-care.

Recommendation to address the problem

175. Information, advice, education and support should be widely available for people with COPD. This involves more widespread access to expert patients programmes, offering everyone with COPD a personalised care plan, and supporting people with COPD to self-care.

176. The aim of care plans and self-care support is to prevent exacerbations through lifestyle adaptation and to allow people to acquire the skills to treat their exacerbation at an early stage. Turnock et al (2005) systematically reviewed the literature comparing action plans with the usual care for COPD.[51] From the three studies included, there was no evidence of any effect on healthcare utilisation, health-related quality of life, lung function, functional capacity, symptom scores, mortality, anxiety and depression. Evidence of a positive effect was detected in one primary (medication usage) and one additional outcome (self-management). The number of exacerbations, length of exacerbations and days lost from work were not recorded as outcomes in any of the trials.

177. There have been studies into the cost-effectiveness of several self-care interventions (such as self-care training courses). The results of the studies are not conclusive but there is growing evidence for many interventions that indicates that they are either cost neutral or represent net benefits. The document 'Research evidence on the effectiveness of self-care support' provides a detailed summary of available evidence on a number of self-care interventions.[52]

Assessment of costs and benefits

General assumptions

178. The costs and efficiency savings outlined in this recommendation are for individuals with COPD among other possible long-term conditions (e.g. diabetes, asthma). Self-management interventions for people with COPD with co-morbidities (approximately 30% of patients) may be met through another long-term condition area and not necessarily be a consequence of the COPD strategy. However, any benefits (efficiency savings) will help those with COPD.

179. For the analysis, it is assumed individuals with a care plan are excluded from the incremental impact associated with self-care support (outlined below). This implies that individuals eligible for self-care support are those without a care plan.

Care plans

180. It is estimated that 60% of COPD patients have a care plan in place for managing their condition.[53] The take-up of care plans is expected to improve as a consequence of the COPD strategy, due to the enhanced management of COPD patients through interventions such as regular reviews. The take-up of care plans for COPD patients is estimated to improve gradually.

2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
68%	73%	76%	80%	85%	95%

Costs

181. Costs and benefits for care planning were originally estimated in a Department of Health impact assessment.[54] Costs of care plans were calculated on the basis of discussions with people implementing care planning and how much time it takes to set up a care plan for people needing different levels of care. The average cost of a care plan is estimated to be £18.

Efficiency savings

182. Department of Health analysis of the relationship between the GP patient survey and hospital episode statistics showed that a one-percentage point increase in the number of people with a long-term condition with a care plan is associated with 11,400 fewer emergency admissions, 126,000 fewer outpatient attendances, and an additional 3,700 elective admissions. Applying this information to COPD patients suggests that the impact per patient is as follows.

Impact	Average cost*	Annual costs saving per 1% increase in care plans
Emergency admissions	£1,576	£117
Outpatient	£98	£80
Elective	£1,576	-£38
	Total	**£159**

*Weighted average from NHS Reference Costs 2006-07.

183. This implies a net annual cost saving per care plan of £141 (i.e. £159 less £18 for cost of a care plan). See the 'Summary of efficiency savings' table for further information about profiled net costs.

Non-monetised benefits

184. The qualitative and non-quantifiable benefits associated with care plans include:

- a reduction in the use of primary and secondary care (including reduction in GP visits, inpatient admissions, emergency admissions, outpatient appointments, emergency bed days);
- better use of health information leading to reduction in pain, disabilities, anxiety and depression; and
- improvement in quality of life and increase in life expectancy.

Risks

185. Some potential risks to delivery are noted:

- lack of demand for self-care support by COPD patients; and
- lack of mechanisms for incentivising the NHS to adopt universal care planning.

Self-care support

186. As outlined previously, only patients with no care plan are considered eligible for self-care support (in this analysis). It is estimated that around 178,000 (23%) of COPD patients are eligible for self-care support, but over time this group is expected to reduce as more patients take up care plans. At the baseline, it is estimated that approximately 20% of COPD patients receive some level of self-care support.

Costs

187. There are three elements to the cost of self-care support: the cost of the self-care support interventions (providing information, skills training), the costs of a health professional's time discussing self-care options, and the costs of providing information about self-care options.

188. Costs on self-care interventions are taken from a range of studies, and data comes from a range of providers.[55] This suggests that providing information costs around £50 per patient per year and that a six-week skills training course of two hours per week costs £200 (including training materials for course participants and training costs for volunteer trainers). The cost of providing self-care support advice is assumed to be three minutes of a GP/practice nurse's time, an average cost of £6. This gives an estimated weighted average cost per person of £77.

189. The cost savings stem from patients better managing their condition and thereby reducing their demand for healthcare services. Evidence outside the COPD area suggests that this relationship is possible.[56] Savings are known to differ by the level of patient need. It is assumed that low-intensity users make up 70% of COPD patients, medium-intensity users make up 25%, and high-intensity users make up the remaining 5%. Department of Health analysis (using the 2006 General Household Survey) estimates the impact of self-care support on health service usage as follows.

		Reduction in service use		
Service	**Cost per visit**	**Low-intensity users**	**Medium-intensity users**	**High-intensity users**
GP visits	£34	32%	36%	40%
Outpatient	£98	39%	44%	49%
A&E	£83	32%	36%	40%
Inpatient	£1,576	26%	29%	32%
Savings per person		**£185**	**£293**	**£559**

190. Under the assumptions outlined, the estimated average annual net saving per patient is £120. See the 'Summary of efficiency savings' table for further information about profiled net costs.

Non-monetised benefits

191. The qualitative and non-quantifiable benefits associated with self-care include:

- a reduction in the use of primary and secondary care (including reduction in GP visits, inpatient admissions, emergency admissions, outpatient appointments, emergency bed days);
- better use of health information leading to reduction in pain, disabilities, anxiety and depression; and
- improvement in quality of life and increase in life expectancy.

Summary of efficiency savings

	Net savings (£m)					
	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16*
Care planning	£8	£13	£16	£17	£18	£29
Self-care	£2	£3	£5	£7	£8	£8
Total	**£10**	**£16**	**£21**	**£24**	**£26**	**£37**

*Net savings for 2016/17 to 2019/20 are assumed to be the same as those in 2015/16.

RECOMMENDATION 17: The quality of the identification and management of exacerbations should be improved and all people with COPD who have an exacerbation should be reviewed afterwards to ensure that their treatment remains optimal and relapses are reduced to a minimum.

What is the problem?

192. COPD exacerbations are associated with worsening quality of life,[57] faster disease progression[58] and increased mortality.[59] They are also a significant cause of hospital admission, readmission and considerable healthcare cost.[60] Some people with COPD are prone to frequent exacerbations; 'frequent exacerbators' are people requiring two or more courses of antibiotics and/or corticosteroids in a 12-month period.

Recommendation to address the problem

193. Prompt or early presentation for treatment from the onset of exacerbation symptoms has been shown to improve outcomes.[61] Thus, it is important that people who develop exacerbations, together with their carers, are able to understand and recognise exacerbation symptoms.

Assessment of costs and benefits

Baseline assumptions

194. It is estimated that there are around 94,000 hospital admissions for COPD exacerbations each year.[62] It is assumed that the baseline provision of reviews after an exacerbation requiring hospitalisation is around 10% (9,400 admissions). This implies there are an estimated 85,000 admissions that are currently not receiving a review after an exacerbation requiring hospitalisation.

Intervention assumptions

195. Local decision makers will decide the method by which a review is conducted. For simplicity it is assumed there are two methods available:

- non-consultant-led, face-to-face – unit cost £98;[63] and
- non-consultant-led, non-face-to-face – unit cost £38.

196. It is expected that there will be a mixture of face-to-face and non-face-to-face reviews. The best estimate is assumed to be a 50:50 split between the two methods, which implies an average unit cost per review of £68. Compliance with reviews is estimated to be around 75% (50%–100%).

Summary of total costs

197. The table below provides a summary of the estimated cost for the different review methods assumed.

	Low cost (non-face-to-face) £m	Best-estimate (50% face-to-face) £m	High cost (face-to-face) £m
10-year (undiscounted)	£16.83	£44.94	£86.17
Average annual cost	£1.70	£4.50	£8.60

RECOMMENDATION 18: All people with COPD in respiratory failure should be issued with oxygen alert cards, and ambulance staff should be able to recognise and respond appropriately to respiratory failure in COPD.

What is the problem?

198. When people with COPD have a severe exacerbation and require transport by ambulance to hospital, it is important that they receive the right amount of oxygen at the right rate, which can be difficult to assess accurately without complex equipment that is not carried in the ambulance. This problem can be over come to some extent if the patient carries a card indicating the usual concentrations of gases in their blood. This will help a suitably trained paramedic to make an on-the-spot decision about how to deliver the patient's oxygen needs.

Recommendation to address the problem

199. Oxygen alert cards should be provided and ambulance staff trained in their use. As mentioned above, we will also be producing a workforce strategy that sets out all the training and other activities that will be needed to prepare the NHS workforce to deliver the recommendations within the strategy.

Assessment of costs and benefits

Baseline assumptions

200. Currently, there is no centrally collected data on the equipment carried by ambulances or other emergency care vehicles in England. To estimate the number of ambulance and emergency care vehicles requiring additional oximeters to meet the recommendation, it was necessary to rely on individual ambulance trust estimates and apply the findings nationally.

201. Information from one ambulance trust suggests the following groups will be required to ensure they have suitable equipment (oximeters) to meet the recommendation.

Group	Approximate number per ambulance trust
Double manned ambulance (DMA)	200
Rapid response vehicle (RRV)	100
Community responders	50
Emergency care practitioners (ECP)	3
Basic doctors	10
Operational managers	10
Operational staff responders	20

202. Information from one ambulance trust suggests that all DMAs and RRVs have equipment capable of measuring oxygenation in COPD patients. However, for the other groups (community responders, ECPs etc) there would be, in general, a need to purchase additional equipment.

Costs

203. It is assumed that all trusts in England will have pulse oximetry equipment in all DMAs and RRVs. Even if this is not the case, there would be only a relatively small cost associated with purchasing this equipment, approximately £400.

204. It is estimated that around 100 fingertip devices for measuring oxygenation would need to be purchased in each ambulance trust for community responders and ECPs. The unit cost of this equipment is estimated at £288, or approximately £30,000 per ambulance trust. This assumes a one-off capital cost spread over the first two years. Therefore, the total cost of the recommendation is estimated at **£320,000** (£160,000 in year 1; £160,000 in year 2).

RECOMMENDATION 19: People with COPD should receive a specialist respiratory review when acute episodes have required referral to hospital. They should be assessed for management by early discharge schemes, or by a structured hospital admission, to ensure that length of stay and subsequent readmission are minimised.

What is the problem?

205. People with COPD presenting to hospital often have severe exacerbations complicated by respiratory failure. It is important that the exacerbation be accurately diagnosed,[64] with complications of the exacerbations, including respiratory failure, treated and other conditions that can mimic the exacerbation considered.[65] Pre-existing conditions also need to be recognised and treated.

206. There are various models of care available for people presenting with exacerbations, including self-management and, avoidance of hospital admission and with schemes such as hospital at home and early supported discharge following assessment and review in a hospital setting by specialist respiratory healthcare professionals.[66] Currently, the availability of these schemes is patchy across England but they have real potential to improve both the quality and efficiency of services and to reduce the cost of the acute episode.

Recommendation to address the problem

207. Evidence from a UK audit of management of COPD exacerbations in secondary care has shown that outcomes are better in hospitals where specialist respiratory physicians are present.[67] Thus, people require assessment by medical teams with experience in the management of respiratory failure in COPD.

208. The hospital at home and supported discharge schemes have been shown to be effective with similar rates of hospital readmission, but they are preferred by people with COPD and are cheaper than usual care.[68]

Assessment of costs and benefits

Baseline assumptions

209. Expert opinion suggests the following:

COPD severity stage (GOLD)	Number of patients in severity group*	Exacerbations per year**	Proportion requiring a hospital admission**	Hospital admissions per year
1 – mild	56,511	0.5	0%	0
2 – moderate	263,717	1.5	1%	4,000
3 – severe	301,391	3	5%	45,000
4 – very severe	150,695	4	7.5%	45,000

*DH analysis of Health Survey for England (2001). See annex 1 for further details.
**DH COPD programme board member.

210. Using the table above, it is estimated that there are 94,000 hospital admissions for COPD exacerbations each year.

211. Currently, each year an estimated 18% (17,000) of COPD exacerbation admissions are placed on the early discharge scheme, sometimes referred to as Hospital at Home.[69]

Intervention cost and assumptions

212. The recommendation is that early discharge schemes should continue to be encouraged for COPD patients. It should be recognised that not all COPD patients will be eligible for early discharge because of, for example, the severity of their exacerbation, other health problems etc. It is estimated that approximately a quarter of all COPD admissions for an exacerbation should be eligible for early discharge schemes.[70] Compared with the baseline, this implies that there is a potential to increase the number of admissions placed on the early discharge scheme by 7 percentage points, or 7,000 admissions.

213. The early discharge scheme involves a specialist nurse visiting a COPD patient's home over a period of approximately eight days to provide support. It is assumed that each specialist nurse visit lasts 20 minutes and there is an average of 3.8 visits,[71] giving an estimated staff cost of **£105** per patient.[72]

214. COPD patients on the early discharge scheme may be given medication (for example antibiotics, corticosteroids, nebulised bronchodilators) and possible temporary oxygen to aid their recovery.[73] It is assumed that all patients accepted onto the scheme will receive these at an estimated combined cost of **£80** per patient.[74] Hence, overall the cost of providing the early discharge scheme is approximately **£185** per patient.

215. Before a COPD patient is considered for an early discharge scheme they would have received support in hospital to stabilise and assess their condition. It is assumed that a patient eligible for the scheme would have an average length of stay of around 1.5 days at a cost of **£526.**[75] This implies that the total cost generated by an early discharge COPD patient is approximately **£710**.

216. It is assumed that previously the 7,000 annual admissions would have an average length of stay of around five days at a cost of **£1,288**.[76] This figure used is for a COPD patient who could potentially be considered stable enough for an early discharge scheme (i.e. no non-invasive ventilation (NIV) required or complications).

217. In summary, for each additional COPD patient placed on the early discharge scheme it costs £710, as opposed to £1,288 if they were to remain under hospital care. Hence there is a cost saving of around **£580** per COPD patient, and a bed-day saving of three days.

Evidence on the effectiveness of early discharge schemes

218. Several studies have reported that there is no statistically significant difference between standard care and early discharge schemes for COPD patients in terms of readmissions, mortality, health-related quality of life, GP visits and increased carer support.[77] All of the studies were conducted over an eight-week period after the initial exacerbation. Therefore, it is possible to conclude that early discharge schemes have no adverse impact on the health of the patient or on health resources. It should be noted that a number of studies have reported high patient satisfaction with the early discharge scheme.[78]

Summary of costs and savings

219. In summary, the average annual cost of extending early discharge schemes for COPD patients is estimated to be £4.8 million (£48.7 million over ten years). At the baseline (i.e. without early discharge schemes), the estimated average cost is around £8.8 million per year (£88 million over ten-years). This implies that the total ten-year (undiscounted) estimated net cost of the recommendation is -£39 million (-£35 million – -£43 million), with an average annual net cost of -£3.9 million. It should be noted that the efficiency savings are achieved through an estimated annual bed reduction of 21,000 bed days.

RECOMMENDATION 20: All people with acute respiratory failure should be identified and investigated promptly and offered treatment with non-invasive ventilation (NIV) with access to mechanical ventilation, if required.

What is the problem?

220. According to a recent RCP audit, some hospitals that treat people with COPD have little or no access to NIV.

Recommendation to address the problem

221. For those with severe COPD, use of a nasal or face mask can improve breathing and quality of life, while reducing costs, and it is therefore important to identify quickly those who would benefit from this approach, which can be provided on specialist wards and therefore does not incur the cost of intensive care admission. Prompt assessment for NIV is therefore necessary.

Assessment of costs and benefits

Baseline exacerbation assumptions

222. Expert opinion suggests the following:

COPD severity stage (GOLD)	Number of patients in severity group*	Exacerbations per year**	Proportion requiring a hospital admission**
1 – mild	56,511	0.5	0%
2 – moderate	263,717	1.5	1%
3 – severe	301,391	3	5%
4 – very severe	150,695	4	7.5%

*DH analysis of Health Survey for England (2001). See annex 1 for further details.
**DH COPD programme board member.

223. Using the table above, it is estimated that there are 94,000 hospital admissions for COPD exacerbations each year.

224. The RCP audit (2008) found that of COPD patients admitted to hospital (non-elective), 11% received NIV and 1% received invasive ventilation (IV).

225. The criterion for when ventilatory support should be required is based on national guidelines:

"*NIV should be considered in all patients with an acute exacerbation of COPD in whom a respiratory acidosis (pH <7.35 PaCO2 >6kPa) persists, despite immediate maximum standard medical treatment on controlled oxygen therapy for no more than 1 hour.*"[79]

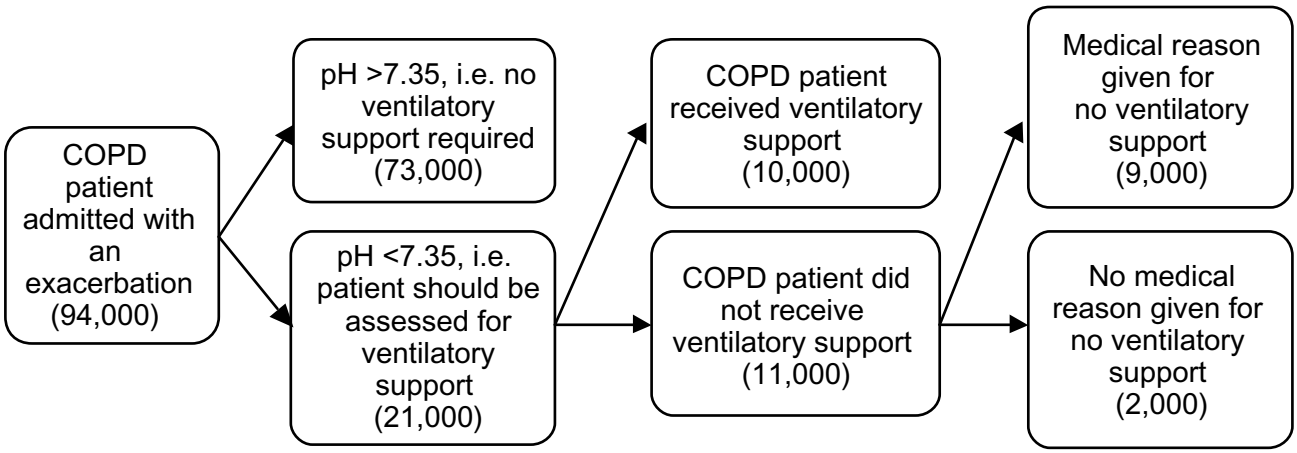
226. The RCP audit (2008) reported that 22% of COPD patients admitted to hospital (non-elective) had pH <7.35 at some time during their admission. Using the estimate for annual hospital admissions for COPD exacerbations, it implies that there are approximately 21,000 admissions where an assessment for ventilatory support should be undertaken.

227. Of COPD admissions with pH <7.35, the RCP audit (2008) reported that approximately 50% (10,000) received either NIV or IV. Hence an estimated 11,000 admissions were candidates for ventilatory support, according to national guidelines, but did not receive either NIV or IV.

Intervention

228. Of COPD patients with pH <7.35 and no ventilatory support (11,000), approximately 22% (2,000) had no recorded medical reason for not receiving NIV.[80] Therefore it is assumed that approximately an additional 2,000 patients admitted to hospital should receive NIV who currently do not. This equates to an additional 2.7% of all COPD admissions.

229. The diagram below illustrates the process and the number of admissions in brackets.

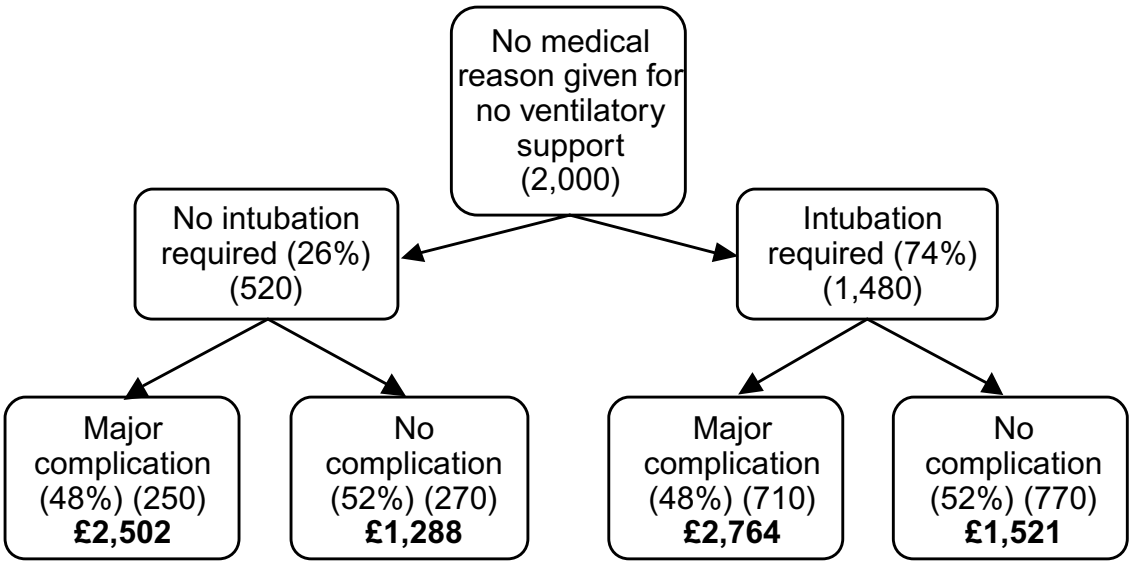


230. Evidence suggests that if COPD patients experiencing an exacerbation are not given NIV (under the criterion), there is a higher probability of requiring endotracheal intubation and of complications, both of which lead to a longer length of stay.[81] Therefore, giving NIV to COPD patients who should receive it but currently do not may reduce the need for intubations. This should produce cost savings from a reduction in bed days.

231. To analyse the impact of the intervention, it is assumed that at the baseline COPD patients who should receive NIV but do not would have a higher probability of requiring endotracheal intubation and of complications. This implies higher costs associated with treating the exacerbation. With the intervention, the same patients would have a lower probability of requiring endotracheal intubation and of complications, hence treatment costs would be lower. The difference between the two approaches gives the net cost.

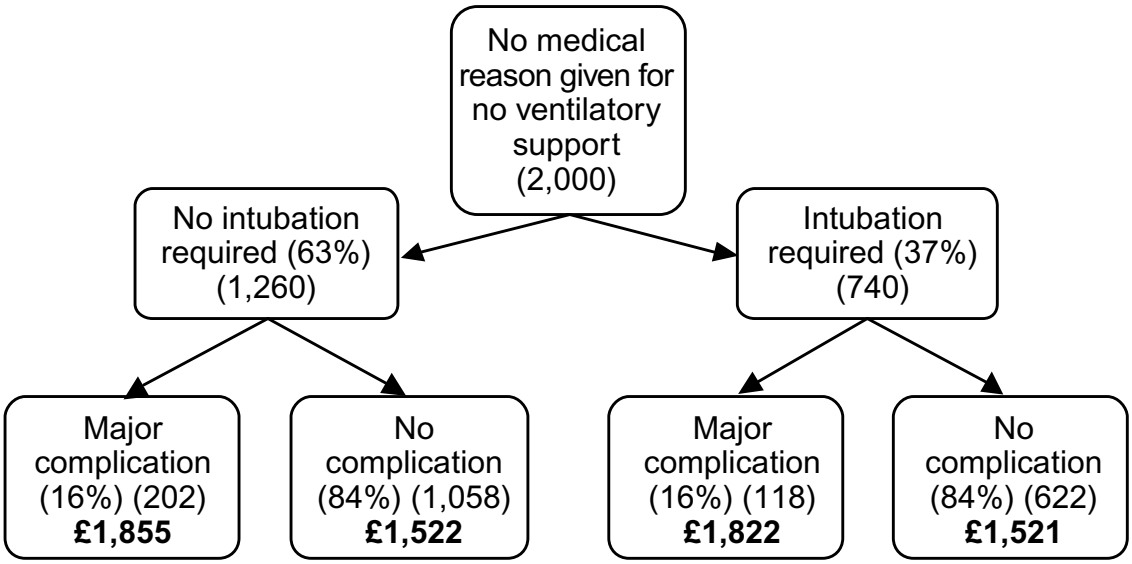
232. The cost of non-elective COPD patient hospital admission without NIV and with or without intubation has been taken from the NHS reference costs. The same approach has been taken for a non-elective COPD patient hospital admission with NIV. The diagrams below illustrate the baseline and intervention flow of patients and the associated costs.

Baseline – no NIV



233. This implies that at the baseline the weighted average cost of treatment for COPD patients who are candidates for NIV is approximately £2,000.

Intervention – with NIV



234. This implies that with the intervention the weighted average cost of treatment for COPD patients who are candidates for NIV is approximately £1,600.

Summary of costs and savings

235. In summary, the average annual cost of extending NIV for COPD patients is estimated to be £3.4 million (£34 million over ten years). At the baseline (i.e. without NIV) the estimated average cost is around £4.5 million per year (£45 million over ten years). This implies that the total ten- year (undiscounted) estimated net cost of the recommendation is **–£10.5 million** (–£9.5 million – –£11.5 million), with an average annual net cost of **–£1.5 million**.

Chapter 5: End-of-life care

RECOMMENDATION 21: There should be improved access to high-quality end-of-life care services that ensure equity in care provision for people with severe COPD, regardless of setting.

What is the problem?

236. As COPD is generally a slowly progressive condition it is difficult to identify when someone is entering the last few months of life, and patients and their carers do not always consider what their needs might be early on, in consultation with healthcare professionals. Managed in the right way, a lot can be done to reduce pain and suffering, and support the patient through the last phase of the patient's life. People often do not like talking about this subject.

Recommendation to address the problem

237. Better communication between healthcare professionals and patients and their carers about provision of end-of-life care, and more equitable access to services.

Assessment of costs and benefits

238. The recommendation is consistent with the End of Life Care Strategy and does not imply any additional resources.

RECOMMENDATION 22: Access to information and appropriate support should be available for carers and those who are bereaved.

What is the problem?

239. As in the case of all bereavement, carers, friends and relatives of the deceased need access to information and support to help them come to terms with things. This has been mentioned as an area of concern by carers of people with COPD, and there is no formal model of provision of support for bereaved relatives of people who had COPD.

Recommendation to address the problem

240. The Department of Health is funding work to provide a bridge between acute hospital and voluntary bereavement support organisations.

Assessment of costs and benefits

241. Currently no model of provision exists for bereaved relatives of people with COPD who may be long-term carers, although individuals do seek support from voluntary organisations. National work is under way that aims to provide a menu of solutions bridging the gap between acute hospital and voluntary bereavement support organisations. This will be used to inform a national pilot and evaluation, aimed at supporting the person with COPD and their relatives and carers along the end-of-life and bereavement pathway. Costs and benefits will be established as part of the pilot work.

Chapter 6: Asthma

RECOMMENDATION 23: The NHS should recognise similarities and differences between asthma and COPD and should commission services accordingly to optimise the model of provision of care.

What is the problem?

242. As asthma and COPD are both diseases of the lung there exists a good deal of confusion between the two, due to the similarities in symptoms (such as wheezing), misdiagnosis and poor management of the conditions. There are some major differences in treatment regimes. Also, services aimed at improving people's lung health are likely to be of benefit to people with asthma, as well as those with COPD.

Recommendation to address the problem

243. In order for services to be commissioned in a way that optimises the provision of care, we will develop a Good Practice Guide concerning adults with asthma.

Assessment of costs and benefits

244. The overall aim of asthma management is to control the disease. With the correct treatment and care, the symptoms of asthma can be well controlled in most people, allowing them to enjoy a healthy and active life. The aim of asthma treatment is to achieve high levels of control – defined by the removal of symptoms, quality of life impairment and exacerbations – which is of key importance to people with asthma both in terms of their current health status and their risk of future adverse outcomes. We have not yet been able to quantify the exact costs of optimising care and treatment for people with asthma but will do so in the final impact assessment.

RECOMMENDATION 24: People should be managed according to evidence-based guidelines.

What is the problem?

245. The asthma field is already well provided for in terms of evidence-based guidelines, and the British Asthma Guidelines (a British Thoracic Society/Scottish Intercollegiate Guidelines Network initiative) are regularly and dynamically updated. However, we have been advised by Asthma UK that many people with asthma are not treated according to these clinical guidelines.

Recommendation to address the problem

246. The Department of Health is supporting the production of additional evidence-based guidelines to ensure that services are provided in accordance with the published British Asthma Guidelines.

Assessment of costs and benefits

247. The development of the guidelines will assist commissioners in developing good-quality services for people with asthma. We estimate that this will result in fewer admissions and better quality of life, and detailed assessment of costs and benefits will be developed to support the publication of the Good Practice Guide.

Annex 1: Specific impact tests

Type of testing undertaken	Results in evidence base?	Results annexed?
Competition Assessment	See below	See below
Small firms impact test	See below	See below
Legal aid	See below	See below
Sustainable development	See below	See below
Carbon assessment	See below	See below
Other environment	See below	See below
Health	The strategy is a health strategy; this consultation impact assessment addresses its impact	See rest of this document
Race equality	An assessment of equality issues is provided in the draft Equality Impact Assessment	See draft Equality Impact Assessment
Disability equality	An assessment of equality issues is provided in the draft Equality Impact Assessment	See draft Equality Impact Assessment
Gender equality	An assessment of equality issues is provided in the draft Equality Impact Assessment	See draft Equality Impact Assessment
Human rights	An assessment of equality issues is provided in the draft Equality Impact Assessment	See draft Equality Impact Assessment
Rural proofing	See below	See below

Competition assessment
The COPD strategy will not have any major impact on competition.

Small Firms Impact Test
While the COPD strategy may have implications for service providers in the health and social care sectors, it is considered that the impact on small firms is not disproportionate, although this will be reviewed as part of the consultation process.

Legal aid
The COPD strategy will not have any impact on legal aid.

Sustainable development
The COPD strategy takes account of and supports the five principles of sustainable development:

- living within environmental limits;
- ensuring a strong, healthy and just society;
- achieving a sustainable economy;
- using sound science responsibly; and
- promoting good governance.

Carbon assessment and other environment
The COPD strategy will have a low impact on carbon and other environmental considerations. The HM Treasury Green Book notes that, in cases where quantification is impractical, a qualitative assessment of the policy is appropriate. The COPD strategy includes recommendations for specialist acute COPD centres, and as a result patients may travel further for the most appropriate treatment. The increased distance of ambulance travel is offset by the huge clinical benefits for COPD patients who are treated in specialist centres.

Health impact test
The whole focus of the COPD strategy is to promote a positive impact on health. This is reflected throughout the main body of the impact assessment. The COPD strategy is designed to help reduce health inequalities.

Single Equality Impact Assessment
This document is accompanied by a Single Equality Impact Assessment, which examines the impact of the strategy on race, disability, gender and human rights.

Rural proofing
The strategy document recognises the importance of developing high-quality COPD services that can be accessed by all individuals, including those in rural areas. The strategy is designed to offer guidance for local commissioners and providers to develop services that meet local needs.

Annex 1: COPD Prevalence in England

The purpose of this annex is to provide estimates of the prevalence of COPD in England, and to document the sources of data and analysis for these estimates.

Headline COPD prevalence data

Table 1: Summary of the prevalence of COPD in England in 2008 and 2009

	Proportion of population with COPD	Number of people in 2008*	Number of people in 2009*	Source
Underlying prevalence of COPD (post-bronchodilator estimate)**	Approx 8.2% to 8.3% of the population aged 16+	3.5 million	3.5 million	*Health Survey for England 2001* combined with ONS population data – adjusted using supplemental data from Perez-Padilla et al. (2007)†
Diagnosed prevalence of COPD	Approx 1.5% of the total population	800,000	834,000	Quality and Outcomes Framework statistical bulletins (2008/09 and 2007/08) data combined with Office for National Statistics population data
Undiagnosed prevalence of COPD (post-bronchodilator)‡		2.7 million	2.7 million	Based on the GOLD defined prevalence minus the diagnosed prevalence

*Numbers are rounded as they represent approximations.

**Note that estimates of underlying prevalence, based on pre-bronchodilator results, would be 11.3% of the population aged 16+, and would approximate 4.6 million people in 2009.

†Perez-Padilla et al. Impact of bronchodilator use on the prevelance of COPD in population-based samples. Journal of COPD 2007; 4: 113-20.

‡An estimate of undiagnosed prevalence, based on pre-bronchodilator results, would be 3.2 million.

Estimates of COPD prevalence by stage

There are two key issues for estimating COPD prevalence by Stage:

- Alternative definitions of stage, namely the Global Initiative for Obstructive Lung Disease (GOLD) guidelines[82] and the National Institute for Health and Clinical Excellence (NICE) COPD guidance.[83] It should be noted that the GOLD and NICE definitions are not equivalent, in that the GOLD stage refers to airway obstruction, while the NICE stage refers to the COPD severity stage more broadly.
- Pre- and post-bronchodilator measurements of lung function.

Prevalence estimates in this annex are based on GOLD definitions of stage and using a bronchodilator adjustment.

Given measurements of lung function from the *Health Survey for England 2001* (HSE), it is possible to derive an estimate of the breakdown of the individuals with COPD – **by severity stage** – i.e. mild, moderate, severe or very severe, using GOLD (2007) definitions of airway obstruction.

Estimates of the underlying prevalence of COPD

There is a requirement to adjust the underlying prevalence to account for the use of bronchodilators and the need for a distribution of the underlying prevalence by age. The following approach is used to estimate the prevalence:

- The adjustment is applied to the raw prevalence data from the HSE to provide age-specific prevalence rates.[84]
- The age-specific prevalence rates are then summed to provide an overall population prevalence rate.
- There is an assumption that the effect of bronchodilators is independent of age, but varies across severity stage. Bronchodilators have an impact at the GOLD mild and moderate stages.

Underlying prevalence and undiagnosed prevalence, using the GOLD definition

The breakdown of these results by severity stage and the post-bronchodilator estimates are presented in Tables 2 to 4 below. There is a substantial difference when the adjustment is made for the lack of bronchodilator use compared to the raw data before this adjustment. In 2009, the estimates are **4.65 million** (pre-bronchodilator prevalence) and **3.5 million** (post-bronchodilator prevalence).

Table 2: The underlying prevalence of GOLD severity stage COPD (after post-bronchodilator adjustment)

COPD GOLD severity stage	Proportion of underlying COPD in the population (2008)	Number of COPD cases in the population (2008 estimate)*	Proportion of underlying COPD in the population (2009)	Number of COPD cases in the population (2009 estimate*)
Mild	31.75%	1,095,000	31.74%	1,107,000
Moderate	39.82%	1,373,000	39.81%	1,389,000
Severe	23.37%	806,000	23.38%	815,000
Very severe	5.06%	175,000	5.07%	177,000
Total		3,448,000		3,488,000

Source: Department of Health analysis of HSE 2001; disease severity stage based on GOLD (2007) guidelines
*Numbers are rounded, so may not tally.

Table 3: Underlying COPD prevalence by age and severity using GOLD-defined underlying prevalence (post-bronchodilator)

Age bands	COPD GOLD stage				Total
	1	2	3	4	
16–24	72,090	45,861	15,322	0	133,274
25–34	85,513	74,183	26,506	0	186,202
35–44	155,890	120,941	23,571	3,367	303,769
45–54	240,022	176,186	42,513	13,081	471,803
55–64	208,949	296,352	140,989	38,772	685,062
65–74	219,323	301,510	146,473	50,947	718,254
75+	125,228	373,675	420,017	70,789	989,710
Total*	**1,107,015**	**1,388,709**	**815,392**	**176,957**	**3,488,073**
Proportion of total by severity stage	31.74%	39.81%	23.38%	5.07%	100.00%

Source: Department of Health analysis of HSE 2001; disease severity stage based on GOLD (2007) guidelines
*Numbers are rounded, so may not tally

Table 4: Undiagnosed COPD prevalence by severity, using GOLD-defined underlying prevalence

	2008	2009
Mild	1,095,000	1,107,000
Moderate	1,088,000	1,102,000
Severe	481,000	488,000
Very severe	12,000	13,000
Total*	**2,676,000**	**2,710,000**

*Numbers are rounded, so may not tally

Sources

The key data sources, which form the basis of these estimates, are the following:

- Department of Health analysis of HSE 2001 data;[85] the HSE 2001 is the most up-to-date national health survey, which includes estimates of lung function in a large sample of the population. In 2001, the HSE involved sending a nurse to the respondent's house to conduct spirometry and obtain a measure of lung function.
- Office for National Statistics population projections for England;[86] this data is based on projections from 2006 and represents the most up-to-date national population estimates available.
- Quality and Outcomes Framework statistical bulletin;[87] this provides annual data on recorded disease prevalence, on GP registers in England.
- Supplemental data from a study by Perez-Padilla et al. (2007).[88]

Annex 2: Costs of COPD

This annex outlines the baseline costs for the treatment and prevention of COPD. The baseline direct costs are estimates of the current (or most recently available) spending for publicly-funded health services (in most cases for the year 2008/09). The results are summarised in the table below (these are generally conservative or lower-bound estimates – other estimates are presented in more detail below).

Table 1: Summary of COPD direct costs to the NHS

Component	Central estimate	Maximum
Direct costs		
Primary care	£78m	£198m
Pharmaceuticals	£263m	£263m
Secondary care	£386m	£386m
Community services: oxygen therapy	£63m	£63m
Prevention: vaccinations	£20m	£20m
Total	**£810m**	**£931m**

The following outlines the current direct costs of COPD to the Department of Health and the NHS. The following caveats should be noted:

- Some data is not available for the most recent years, so best estimates are made using pay or price inflation assumptions.
- Some costs are not attributable solely to COPD, e.g. preventive activities. For example, all smoking prevention activities relate to the prevention of COPD, as smoking is the major risk factor; however, these activities also prevent other diseases, such as stroke and lung cancer.
- Because of data uncertainty, ranges of costs have been presented where possible.

Primary care

Estimates of the primary care costs are made up of the costs of GP consultations attributable to COPD. These costs are estimated using:

- the number of GP consultations per person per year attributed to COPD;
- the prevalence of COPD (using the lower-bound NHS Information Centre estimate of prevalence and the upper-bound estimate of prevalence based on Sahab et al. (2006); and

- unit costs for a GP consultation based on the Personal Social Services Research Unit (2008) unit costs for an average GP consultation (11.7 minutes); uprated using the Hospital and Community Health Staff (HCHS) pay inflation scale.

Table 2: Costs attributed to COPD for GP consultations

Costing for consultation	Consultations with COPD recorded as the reason for consultation	All consultations for people with COPD
Number of people with recorded COPD	772,000	772,000
Number of consultations per person due to COPD	2.76	7.03
Cost of consultation per person	£36.50	£36.50
Total cost	**£78m**	**£198m**

Pharmaceuticals

Pharmaceutical costs for the treatment of COPD specifically are not available. However, the costs and volumes of drugs typically used to treat COPD are available – although most of these drugs are also used to treat asthma. The costs and volumes of these drugs are listed in the NHS Information Centre's *Prescription cost analysis* (2008).[89] The net ingredient costs of each drug and a total cost are presented in the table below. Drugs that are multi-purpose, i.e. for asthma and COPD, have been apportioned using Quality and Outcomes Framework prevalence rates for the respective diseases. COPD represents 19% of the registered population of people with asthma and COPD, and hence this value is used for apportioning.

Table 3: Drug costs for COPD

Drug prescribed exclusively for COPD	Net ingredient cost
Tiotropium	£98.8m
Carbocisteine	£8.8m
Subtotal (drugs used exclusively for COPD)	£107.6m

Drugs prescribed for COPD and asthma	
Salbutamol	£92.2m
Ipratropium	£16.0m
Salmeterol	£53.9m
Formoterol	£5.5m
Oral theophylline preparations	£2.2m
Respiratory corticosteroids	£577.7m
Total cost of drugs used for asthma and COPD	£747.5m
Apportionment to COPD (%)	19%
Total apportioned to COPD	£155.7m
Total cost of all drugs used for COPD	**£263.3m**

*Based on the number of people with COPD as a proportion of the number of people with COPD and asthma (QOF prevalence data).

Secondary care

Secondary care costs consists of:

- accident and emergency attendances;
- inpatient admissions; and
- outpatient cases.

Accident and emergency (A&E) attendances and emergency journeys

Quarterly data on A&E attendances is collected by the Department of Health.[90] However, this is not broken down by reason for attendance. A study by Downing and Wilson (2004)[91] provides estimates of the reasons for A&E emergency journeys, analysing data available from acute trusts between April 1999 and March 2002. This is used as a proxy for the number of A&E attendances. Combining these estimates with 2008 data from the Personal Social Services Research Unit on the unit cost of an A&E attendance allows us to estimate a cost for A&E attendances attributable to COPD. A cost of approximately £30 million, for 2008/09, is estimated and presented in Table 4 below.

Table 4: Costs of A&E attendances attributable to COPD

	Number	Cost
Total A&E attendances 2007/08	**19,127,993**	
% of Attendances for under-65s related to COPD*	0.1%	
% of Attendances for over-65s related to COPD*	1.4%	
Total COPD attendances for under-65s	19,128	
Total COPD attendances for over-65s	267,792	
Total COPD-related A&E attendances	**286,920**	
Average cost per patient A&E visit		£104
Total A&E attendance cost for COPD patients		**£30m**

*Downing A and Wilson R. Older people's use of accident and emergency services. *Age and Aging* 2004; 34: 24–30.

The results of the approximate costs for emergency journeys apportioned to COPD are presented in Table 5. This uses the same methodology as for A&E attendances (see above) and results in an approximate cost of £39 million.

Table 5: Total cost of emergency journeys attributable to COPD*

	Number	Cost
Total emergency ambulance journeys	7,200,000	
% of A&E journeys for under-65s related to COPD	0.1%	
% of A&E journeys for over-65s related to COPD	1.4%	
Total COPD A&E journeys for under-65s	7,200	
Total COPD A&E journeys for over-65	100,800	
Total COPD-related emergency journeys	**108,000**	
Average cost per emergency journey**		£359
Total COPD emergency journey cost		**£39m**

*PSSRU. Unit costs of Health and Social Care 2008.
**www.ic.nhs.uk/pubs/precostanalysis2008

Inpatient admissions

The most recently available costs for inpatient admissions where COPD was the primary cause of the treatment, are for 2007/08. The total costs were approximately £276 million. The overwhelming majority were for non-elective, ordinary consultations. The total number of cases was around 180,000. This cost is estimated to be **£286 million** for 2008/09 (uprating to 2008/09 by the Hospital and Community Health Staff pay and price inflation series).

Outpatient cases

The following table presents the number of cases and national average unit cost for outpatients. The costs are calculated using NHS reference costs; however, they are not COPD-specific, but are for all respiratory medicine (NHS reference code specialty number 340). To apportion these costs, the proportion of COPD inpatient bed days in relation to total respiratory inpatient bed days is used as a proxy.

Table 6: Outpatient cases and costs for respiratory medicine and COPD

Outpatient (2007/08)	Number of cases	National average unit cost	Total
Consultant-led first attendance face-to-face	196,991	£186	£36.6m
Consultant-led follow-up attendance face-to-face	483,196	£118	£56.8m
Consultant-led follow-up attendance non-face-to-face	250	£50	£0.01m
Non-consultant-led first attendance face-to-face	35,951	£145	£5.2m
Non-consultant-led first attendance face-to-face	402	£48	£0.02m
Non-consultant-led follow-up attendance face-to-face	62,471	£98	£6.1m
Non-consultant-led follow-up attendance non-face-to-face	2,264	£38	£0.09m
		Total all respiratory admissions	£104.9m
		Apportionment used for COPD*	22.54%
		Total outpatient cost apportioned to COPD (2007/08)	£23.6m
		Estimated outpatient cost for 2008/09**	**£24m**

*Apportioned using the number of COPD inpatient bed days as a proportion of the total number of inpatient bed days for respiratory disease.

**Uprated using the Hospital and Community Staff (HCHS) pay and price inflation series.

Table 7: Summary of secondary care costs

Component	Total cost (2008/09)
A&E attendances	£30m
Emergency journeys	£39m
Inpatient	£293m
Outpatient	£24m
Total	**£386m**

Preventive care

Preventive costs include pneumococcal and influenza vaccinations for patients with COPD (which aid prevention of exacerbations). NICE guidelines recommend that patients with COPD receive the influenza and pneumococcal vaccines as part of the management and prevention of exacerbations. Immunisation policy recommends that those over 65 and all those in at-risk groups are given a number of immunisations. Those with COPD are included in the at-risk group.[92] There is limited data available on the number of vaccinations given per year, so the following components are used as presented in the tables below:

Influenza vaccinations

- The unit cost of the vaccination to Department of Health of £14.20. This includes the unit cost of the vaccine and an administration fee paid to the GP.
- Number of people with COPD, based on Department of Health prevalence estimate of 8%.
- Take-up/coverage of the vaccine approximated using 74% coverage of vaccinations among over-65-year-olds based on NHS immunisation statistics sourced from the Health Protection Agency (HPA).[93]
- The estimate is an upper bound in that some COPD patients (e.g. those aged over 65) would have received the vaccine anyway.

Table 8: Estimates of costs of influenza vaccine for those with COPD

Total unit cost of vaccine	£14.20
Number of people with COPD	772,000
Number of people with COPD receiving influenza vaccine	571,000
Total cost	**£8.1m**

Pneumococcal vaccinations

The delivery of the pneumococcal vaccine is different from that of the influenza vaccine. The former is given once in a lifetime whereas the latter is given annually. The policy of providing the pneumococcal vaccine has been recommended since 2005. The proportion of over-65s who have received the vaccination up to March 2008 is 69%. For consistency with the rest of the document, the 2007/08 figure is estimated to be a third of this. Hence, the calculation is made up of:

- the total cost of the vaccination of £46.75, which includes the cost of the vaccine and the payment to the GP for administering the vaccine;
- number of people with COPD, based on the Department of Health's prevalence estimate of 8%; and
- the proportion of over-65s vaccinated (as a proxy for take-up of the vaccine) of 69%.

The estimate is an upper bound in that some COPD patients (e.g. those aged over 65) would have received the vaccine anyway.

Table 9: Estimates of costs of pneumococcal vaccine for those with COPD

Total unit cost of vaccine	£46.75
Number of people with COPD	772,000
Number of people with COPD receiving pneumococcal vaccine (since 2005)	361,000
Total cost	**£12m**

Community services

There is no data available on the level of community services provided for COPD patients; hence, it is possible to present only the unit costs of healthcare professionals who may be involved in providing these services.

Oxygen therapy

Based on data from the Department of Health, the total cost of the home oxygen service was £105 million in 2008/09, and there were 85,000 patients receiving home oxygen services as of June 2008. This provides an approximate cost of £1,235 per patient per year. Some patients receive the service for cystic fibrosis, asthma or palliative care. Approximately 60% of patients on home oxygen therapy are COPD sufferers. **Hence, apportioning the total cost of home oxygen therapy on this basis gives an estimated cost of £63 million.**

Caution should be given to these estimates, as they do not take into account variation in oxygen consumed by all patients registered on home oxygen therapy.

Annex 3: Risky occupations for COPD

Occupation identified	Level of risk (if indicated)	Source(s)
Construction industry	High	Vermuelen et; IEH; HSE
Rubber industry	High	Vermuelen; HSE
Plastics production	High	Vermuelen; HSE
Metal industry (i.e. steel workers)	High	Vermuelen; IEH; HSE
Printing industry	High	Vermuelen
Coal mining	High	DWP; IEH; HSE
Cotton and textile industry (including weaving, spinning)	High	DWP; IEH; HSE
Agricultural and farm workers	High	IEH; HSE
Welders	High	DWP; IEH; HSE
Mill workers and bakers		IEH; HSE
Exposure to wood dust		IEH
Smelter workers		IEH
Coke oven workers		IEH
Spray painters		IEH
Quarrying		DWP; HSE
Grain workers		DWP; IEH; HSE
Brick manufacturing		HSE
Ceramic workers		HSE
Stonemasonry		HSE

Key: Vermuelen = A fuller reference was unavailable
DWP = Department for Work and Pensions
IEH = Institute for Environment and Health
HSE = Health and Safety Executive, www.hse.gov.uk/copd/causes.htm

Using the evidence in the table above, it is estimated that between 2.5 million and 3.5 million of the workforce in England are in occupations deemed a risk for developing COPD. However, it has not been possible to identify data on the number of occupations without sufficient protective equipment (against COPD) in place.

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