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1. Introduction

1.1. Objectives

This costing report and the associated template have been developed to provide NHS Boards with relevant costing information to support the consideration of different delivery models of pulmonary rehabilitation (PR) for people with moderate to severe Chronic Obstructive Pulmonary Disease (COPD). This follows the publication of clinical standards for COPD services in March 2010.

The objective of this resource is to facilitate more effective and efficient implementation of the PR standard and support NHS Boards with advice, tools and techniques to apply the standard to current practice.

The report provides each NHS board with an estimate of the resources and costs required to implement the standard. It does not reproduce the standards and should be read in conjunction with them; and with the other implementation support provided by the pulmonary rehabilitation web resource.

An Audit Commission report in 2005\(^1\) concluded that the lack of robust information on the resources required and associated costs including any potential savings was one of the biggest difficulties in developing plans to implement guidelines and standards. This report aims to provide such information to support implementation of this standard in NHS boards.

As a costing report, it does not attempt to quantify the cost of all aspects of the current diagnosis and management of patients with COPD. Rather, for PR treatment, it provides estimates of:

- the number of individuals in Scotland who will have better health outcomes following its implementation
- the resources required to implement the recommendations
- the associated costs.

No cost-effectiveness analyses are presented within this report.

1.1.1. Target users

This costing report and template have been designed to be used by those actively involved in the planning, delivery and monitoring of PR services. This is likely to include professionals in clinical, finance, planning and Managed Clinical Networks (MCNs).

1.2. Clinical standards for COPD services

The clinical standard relating to PR is:

Standard statement

Pulmonary Rehabilitation is available within the NHS board to people with COPD.

Essential criteria

4a.1 Pulmonary rehabilitation is offered to people with COPD with an MRC dyspnoea scale of 3 or more.
4a.2 Pulmonary rehabilitation is made accessible to people with COPD with an MRC dyspnoea scale of 3 or more.
4a.3 Pulmonary rehabilitation is offered to people with COPD post-exacerbation.
4a.4 Pulmonary rehabilitation incorporates:

- upper and lower body physical training, and
- disease education (including smoking cessation) and medication use.

Desirable criterion

4a.5 Pulmonary rehabilitation incorporates:

- medication management
- nutritional advice
- psychological and behavioural interventions and
- occupational therapy

1.3. Statement of intent

This report is intended to provide an indication of the potential resources required and associated costs involved in the implementation of the PR standard. However, the service provision in each NHS board may vary from the baseline practice assumed, and therefore the resource requirements outlined in this report may not reflect the actual requirements.

The aim is to provide as detailed and comprehensive information as possible, quoting sources and assumptions, so that users can adapt the information for their own purposes. The relevant resource use and costs will vary depending on the context and purpose of the NHS board, thus users should adapt the estimated values to suit their needs. The report, of necessity, has had to omit some of the finer detail underpinning the estimates. If users require further information or advice on using the data, they should visit the PR web resource or contact George English at Healthcare Improvement Scotland by email at george.english@nhs.net.
1.4. Document overview

Section 2 describes the methodology used to estimate the resources required and associated costs. Section 3 describes issues relating to PR in Scotland, including current service provision and estimates for PR treatment. The Appendices include the names of those NHS colleagues who have helped to inform this report; and the stages in the process. A costing template is also available. N.b. this report should be read in conjunction with other parts of the PR web resource.
2. Background and methodology

2.1. Methodology

The resource impact assessment process is summarised in Appendix 2. This report estimates the resources and associated costs required to implement PR. The estimates are based on studies of current baseline practice and predicted changes following implementation of the recommended treatment. The assumptions are informed by available Scottish epidemiology and cost data, consultation with independent healthcare professionals and members of the Short Life Working Group (SLWG) and peer review.

2.1.1. Costing report and template development

Following publication of the clinical standards, an initial stakeholder meeting was held which led to the SLWG being established. This Group’s brief was to develop a guide to implementation of the standard for pulmonary rehabilitation within the clinical standards for COPD services.

The costing report and template have been developed as part of the programme to develop implementation support to provide NHS Boards with further advice, tools and techniques to apply the clinical standards to current practice. They will help NHS boards to estimate the local impact and plan for the financial implications of implementing the PR standard.

Selected SLWG members oversaw the development of the report, advised on key points, ensured relevant aspects were covered and reviewed the draft report and template. Data values and associated spreadsheets were quality assured by a health economist.

The methodology used to develop this report adopts proven processes and principles including the process set out in NICE Developing costing tools.2

2.1.2. Estimation of resources required and associated costs

A structured approach was used to develop a costing model in conjunction with the SLWG. Once the PR standard had been identified as part of the intended direction of travel, a draft patient pathway, showing the changes required to implement PR, was developed. This was developed in conjunction with experts in the field; and also informed by the results of a literature search. ISD provided data on Scottish epidemiology and numbers at national and NHS board level. These data were supplemented with knowledge gained from studying the current services in a large (NHS Greater Glasgow and Clyde), medium (NHS Forth Valley) and small (NHS Dumfries and Galloway) board; and through a number of events including a Consensus Event, Process

__________________________

Mapping Workshop and Clinical Engagement Event; and discussions with experts.

The data from these sources were combined into the costing model. Clinical and independent experts were then asked to validate the pathways and outcomes of the models. Where possible, published resource data from ISD were used and supplemented by other data e.g. from local NHS Boards.

Costs were developed using a ‘bottom-up’ approach, whereby detailed times and resources for the services were then aggregated to estimate overall costs. These are detailed in Section 3 and the Costing Template. Overheads have been added to cover employers’ national insurance, superannuation contributions, training and indirect expenditure. All costs are expressed in 2010/11 price levels and assumed to remain constant in real terms.

At an individual board level, the template will allow numbers and cost parameters to be changed to suit local circumstances. Further implementation support is available on the [PR web resource](#).

### 2.2. Limitations

The analysis is a contribution to the implementation challenges that will be faced by NHS boards in implementing the PR standard. Successful implementation, of course, will depend on a wide range of factors. There are a number of limitations with regard to the scope and content of this report including:

- uncertainty as to what is the current clinical practice in each NHS board. The main methods used to address this uncertainty were to focus on the current services in the three selected NHS boards; to hold various events with clinical and other staff to discuss current practice and map the processes; and discussions with experts.

- the lack of systematically collected data, particularly relating to inputs to the pathway and processes and measures of the resultant outcomes.

- the costs do not capture some resource areas and are therefore likely to understate the implications for NHS boards. Areas which are not costed include other staff who may be involved e.g. allied health professionals; training, maintenance, travel/transport; and any start-up costs. Also options such as a shorter/longer programme or using different grade staff are not evaluated.

- the cost and resource assessments are estimates, based on a number of assumptions. They provide an indication of the possible impact of the PR standard; however local practice may vary from this.

The values in the costing template can be changed to take account of these limitations and reflect local circumstances.
3. PR treatment

3.1. Background

PR is an effective intervention for patients with moderate to severe COPD. In Scotland, there were 106,429 patients with COPD in 2009/10, an increase of 2.0% over the previous year. This is a prevalence rate of 1.95%. There were 2,784 deaths from COPD, as shown in Table 3–1.

Table 3-1 COPD Prevalence and Mortality by NHS board

<table>
<thead>
<tr>
<th>NHS Board</th>
<th>Prevalence 2008/09</th>
<th>Prevalence 2009/10</th>
<th>Prevalence Rate 2009/10</th>
<th>Mortality³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayrshire &amp; Arran</td>
<td>8,528</td>
<td>8,778</td>
<td>2.26</td>
<td>248</td>
</tr>
<tr>
<td>Borders</td>
<td>2,289</td>
<td>2,384</td>
<td>2.05</td>
<td>49</td>
</tr>
<tr>
<td>Dumfries &amp; Galloway</td>
<td>3,519</td>
<td>3,617</td>
<td>2.33</td>
<td>90</td>
</tr>
<tr>
<td>Fife</td>
<td>7,123</td>
<td>7,335</td>
<td>1.96</td>
<td>203</td>
</tr>
<tr>
<td>Forth Valley</td>
<td>5,332</td>
<td>5,640</td>
<td>1.87</td>
<td>179</td>
</tr>
<tr>
<td>Grampian</td>
<td>7,900</td>
<td>8,127</td>
<td>1.42</td>
<td>277</td>
</tr>
<tr>
<td>Greater Glasgow &amp; Clyde</td>
<td>29,838</td>
<td>29,914</td>
<td>2.28</td>
<td>613</td>
</tr>
<tr>
<td>Highland</td>
<td>5,002</td>
<td>5,105</td>
<td>1.58</td>
<td>172</td>
</tr>
<tr>
<td>Lanarkshire</td>
<td>12,394</td>
<td>12,714</td>
<td>2.15</td>
<td>315</td>
</tr>
<tr>
<td>Lothian</td>
<td>12,515</td>
<td>12,803</td>
<td>1.50</td>
<td>366</td>
</tr>
<tr>
<td>Orkney</td>
<td>283</td>
<td>284</td>
<td>1.40</td>
<td>12</td>
</tr>
<tr>
<td>Shetland</td>
<td>198</td>
<td>195</td>
<td>0.86</td>
<td>8</td>
</tr>
<tr>
<td>Tayside</td>
<td>9,020</td>
<td>9,120</td>
<td>2.19</td>
<td>236</td>
</tr>
<tr>
<td>Western Isles</td>
<td>400</td>
<td>413</td>
<td>1.50</td>
<td>16</td>
</tr>
<tr>
<td>NHSScotland</td>
<td>104,341</td>
<td>106,429</td>
<td>1.95</td>
<td>2,784</td>
</tr>
</tbody>
</table>

Notes:
³Quality & Outcomes Framework (QOF) - COPD (from QMAS database, as at July 2009 and 2010 respectively, plus notifications of adjustments from NHS Boards).
²Raw prevalence rate = number of patients on the specified QOF register, divided by general practice list size, multiplied by 100 (ISD).
³Deaths by cause and administrative area 2010: J40-47 Chronic lower respiratory diseases. General Register Office for Scotland

3.2. Patient group

The PR standard recommends PR for COPD patients who have an MRC dyspnoea scale of 3 or more and/or with COPD post-exacerbation and who could benefit from PR. It is estimated that this is approximately half of all COPD patients. The SLWG agreed it would be reasonable, for the purposes of the costing report model, to also aim to offer PR to 10% of existing patients per annum.

Reliable information on the number of new patients per year i.e. incidence is not available. So the incidence has been calculated as the increase in prevalence over the last year i.e. from 2008/09 to 2009/10, plus mortality in the last year (see Table 3-1). Table 3-2 shows estimates of the numbers to be treated per year.

Table 3-2 Estimated number of PR patients per year by NHS board

<table>
<thead>
<tr>
<th>NHS Board</th>
<th>Incidence³</th>
<th>Number of</th>
<th>Estimated number of patients per year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The patient pathway for PR is shown in Figure 3.1.

**Figure 3.1 Diagram of the patient pathway for pulmonary rehabilitation**

Patients may be referred for assessment from a range of primary and secondary care sources. They are then contacted for assessment; which is carried out when they attend. Once the patient decides to go ahead, the main intervention is an exercise and education programme comprising a number of sessions.

**Education** Each pulmonary rehabilitation class typically includes a 30 minute education session and 60 minutes of supervised progressive exercise, with input from different healthcare professionals.

**Exercise** Evidence indicates that PR should include two supervised exercise sessions per week and one additional unsupervised (home) session. The length of the programme should range from 6-8 weeks. Without continued maintenance sessions, exercise benefits decrease following completion of the programme. Further information on the evidence base can be found on the PR web resource.

Arrangements for delivery of the education and exercise programme are dependent on local circumstances and local resources. The delivery programme may be static (cohort of patients join the programme at the same time); rolling (allows people to join the PR programme at any point in a cycle as education topics are repeated on a rolling basis; exercise component is individualised to each patient as with static programmes); or roving (as with the static programme but offered in different geographical locations).
Drop-out rates from such programmes have often been high. If the patient fails to complete the programme, they may come back later for re-assessment and to start the programme again. Further details are available on the PR web resource.

### 3.3. Resources and costs

The resource use and cost estimates are based on the pathway outlined above; and informed by the study of the three boards involved and by expert opinion. The frequency and length of sessions, group sizes and resources are for a 6 week rolling exercise and education programme of 2 sessions per week for up to 12 patients – average of 8 assumed. These are shown in Table 3-3, together with the associated costs.

#### Table 3-3 Resource use and costs for PR treatment

<table>
<thead>
<tr>
<th>Category of resource use</th>
<th>Frequency</th>
<th>Sessions, visits</th>
<th>Time (min)</th>
<th>Group size</th>
<th>Total cost per patient&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Total cost per patient incl. overheads&lt;sup&gt;4&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacting patient for assessment</td>
<td>1</td>
<td>Admin Band 3</td>
<td>10</td>
<td>1</td>
<td>£2</td>
<td>£3</td>
</tr>
<tr>
<td>Assessment&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1</td>
<td>Physio Band 6</td>
<td>30</td>
<td>2</td>
<td>£6</td>
<td>£16</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Nurse Band 6</td>
<td>30</td>
<td>2</td>
<td>£6</td>
<td></td>
</tr>
<tr>
<td>Re-assessment&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1</td>
<td>Physio Band 6</td>
<td>20</td>
<td>2</td>
<td>£4</td>
<td>£10</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Nurse Band 6</td>
<td>20</td>
<td>2</td>
<td>£4</td>
<td></td>
</tr>
<tr>
<td>Exercise/education</td>
<td>12</td>
<td>Physio Band 6</td>
<td>90</td>
<td>8</td>
<td>£6</td>
<td>£54</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Nurse Band 6</td>
<td>60</td>
<td>8</td>
<td>£36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Instructor&lt;sup&gt;2&lt;/sup&gt;</td>
<td>60</td>
<td>8</td>
<td>£30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Venue&lt;sup&gt;2&lt;/sup&gt;</td>
<td>90</td>
<td>8</td>
<td>£41</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Assessment time has been assumed to be 1 hour; re-assessment 40 minutes. N.B. there may be more than one appointment per person, because they come back after previously failing to attend or to complete the sessions.
2. Instructors are assumed to be paid £20 per hour; and, where used, Local Authority venue e.g. sports centre cost is £18 per hour. Typically, there is no charge for sessions held in NHS premises.
3. The total cost per patient includes the gross salary cost for staff, taken as mid point within band (Agenda for Change Pay Circular (AfC 2/2010) plus an adjustment of 24% for whole time equivalent (WTE) costs.
4. Including 30% overheads.

The precise arrangements for delivery of the education and exercise programme are dependent on local circumstances and local resources. Areas which are not costed include other staff who may be involved e.g. allied health professionals; training, maintenance, travel/transport; and any start-up costs.

For the purposes of the costing model, patients fall into three categories: Not Seen (referrals who do not come for assessment); Unsuccessful (who drop out between assessment & completion for various reasons); Successful (who complete the sessions). An estimate of the costs associated with implementing PR treatment per patient, allowing for the proportion of patients treated at each stage, is shown in Table 3-4. It is assumed that 10% of patients are Not Seen; and 10% are Unsuccessful (equivalent to an average
of 85% patients i.e. 90% starting and 80% completing all exercise/education sessions). These drop-out rates vary between NHS boards and the actual local attrition rate needs to be considered.

Table 3-4 Resource use and costs for PR treatment

<table>
<thead>
<tr>
<th>Category of resource use</th>
<th>Total cost per patient</th>
<th>Percentage of patients</th>
<th>Total cost per patient incl. Overheads²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacting patient for assessment</td>
<td>£3</td>
<td>100%</td>
<td>£3.00</td>
</tr>
<tr>
<td>Assessment</td>
<td>£16</td>
<td>90%</td>
<td>£14.00</td>
</tr>
<tr>
<td>Re-assessment</td>
<td>£10</td>
<td>50%</td>
<td>£5.00</td>
</tr>
<tr>
<td>Exercise/Education</td>
<td>£208</td>
<td>85%</td>
<td>£177.00</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td></td>
<td></td>
<td><strong>£199.00</strong></td>
</tr>
</tbody>
</table>

Notes:
1The cost figures shown assume that all costs associated with setting up a venue for PR exercise and education, are included in the venue charge (see Table 3-3). Any other staff used, training, maintenance, travel/transport and any start-up costs are not costed here.
2Including 30% overheads.

Therefore, the average cost for a Successful patient who completes all sessions is £227 at a Local Authority venue; or £186 at NHS premises for which no charge is made.

Overall, the average cost per patient for all patients treated, allowing for the assumed drop-out rates above, is:

Based on the number of patients referred for assessment:
£199

Based on the number of patients who complete exercise/education
£249

Only those completing the exercise/education programme will maximise the benefits; and these will decrease without continued maintenance.
Appendix 1 Contributors to the report

Healthcare Improvement Scotland is grateful to all of the PR Short Life Working Group members who have given generously of their time and expertise, including contributing constructively to the production of this report and template.

Thanks are also due to the following colleagues who assisted in the studies of current services in NHS boards, the supply of information and quality assuring the assumptions and pathways.

Phyllis Murphie  Respiratory Lead Nurse NHS Dumfries & Galloway
Claire Hope    Senior Physiotherapist Pulm Rehab/COPD NHS Dumfries & Galloway
Jennifer Watt  Divisional Finance Manager NHS Dumfries & Galloway
Olwyn Lamont   Lead Respiratory Nurse Specialist NHS Forth Valley
Scott Urquhart Assistant Director of Finance NHS Forth Valley
David Wright   Finance Manager NHS Lothian
Margaret Swankie MCN Manager Respiratory, Stroke and Heart Disease NHS Tayside
Jean Driscoll  Specialist Physiotherapist Community Rehab Team NHS Tayside
Stephen Halcrow Information Analyst ISD
Susan Myles    Lead Health Economist Healthcare Improvement Scotland
Lisa Wilson    Health Economist Healthcare Improvement Scotland
Hilda Emengo   Health Services Researcher Healthcare Improvement Scotland

We hope this has also achieved the important goal of sharing knowledge and best practice to facilitate more effective and efficient implementation of the PR standard across Scotland.
Appendix 2 Resource impact assessment process

Stage 1: Identify standard(s) as part of intended direction of travel

Stage 2: Identify key cost drivers for the standard(s) and gather information on potential pathways and cost evidence

Stage 3: Develop model to estimate resources and costs

Stage 4: Develop resource and costing report

Stage 5: Develop cost template

Stage 6: Internal review with selected SLWG members and Healthcare Improvement Scotland

Stage 7: Circulate report to selected SLWG members and others for review; update report based on feedback and any changes following consultations

Stage 8: Final sign-off

Stage 9: Publication, dissemination as part of PR web resource
**Glossary and abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD</td>
<td>Chronic Obstructive Pulmonary Disease</td>
</tr>
<tr>
<td>Incidence</td>
<td>The frequency with which a disease appears in a particular population or area i.e. the number of newly diagnosed cases during the year</td>
</tr>
<tr>
<td>ISD</td>
<td>Information and Statistics Division (of NHS National Services Scotland)</td>
</tr>
<tr>
<td>MCN</td>
<td>Managed Clinical Network</td>
</tr>
<tr>
<td>MRC dyspnoea scale</td>
<td>Medical Research Council dyspnoea scale. A guide to assessing breathlessness</td>
</tr>
<tr>
<td>Mortality</td>
<td>A fatal outcome i.e. death</td>
</tr>
<tr>
<td>Prevalence</td>
<td>The proportion of individuals in a population having a disease i.e. the number of cases of a disease that are present in a particular population at a given time</td>
</tr>
<tr>
<td>PR</td>
<td>Pulmonary rehabilitation</td>
</tr>
<tr>
<td>SLWG</td>
<td>Pulmonary Rehabilitation Working Group</td>
</tr>
<tr>
<td>QOF</td>
<td>Quality &amp; Outcomes Framework</td>
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