Cost effectiveness of an outpatient multidisciplinary pulmonary rehabilitation programme
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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
A 6-week outpatient rehabilitation programme was under study. Patients received rehabilitation, within groups of up to 10 people, on three half days per week. Each session lasted for approximately 2 hours and included educational activities, exercise periods, and sessions addressing the psychosocial aspects of chronic disability. The programme also included individual goal setting, dietary intervention, physiotherapy, and occupational therapy. At the end of the 6-week programme, the patients were invited to join a patient-run group that met weekly at the local leisure centre. The rehabilitation programme was compared with the usual outpatient or primary care follow-up.

Type of intervention
Rehabilitation.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients with chronic obstructive pulmonary disease (COPD) and patients with other chronic disabling pulmonary pathologies. All the patients had a forced expiratory volume in one second of less than 60% of that predicted, with less than 20% reversibility to inhaled beta-agonists.

Setting
The setting was secondary care. The study was carried out in South Wales, UK.

Dates to which data relate
The dates to which the effectiveness data related were not reported. The price year was not reported.

Source of effectiveness data
The evidence for the final outcomes was derived from a single published study (Griffiths et al., see Other Publications of Related Interest).

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness study.

Study sample
No power calculations to determine the sample size were reported. However, each programme was designed to accommodate up to 20 patients. A total of 200 were referred by primary and secondary care physicians to receive rehabilitation services. The participants were then randomly assigned to either outpatient rehabilitation or to continue
standard medical management. Referred patients were then reviewed by TLG or associated physicians and, before randomisation, medical treatment was optimised for individual participants. If necessary, referrals were made for smoking cessation counselling, dietetic, occupational therapy, or physiotherapy assessment usually available at the hospital. If any changes were made to management, entry into the study was deferred for 2 months after the last change. Eventhough each programme was designed to accommodate up to 20 patients, recruitment was slow during the early stages of the research phase and programmes commenced with 18 to 20 patients. During the study period, 99 patients were included in the outpatient rehabilitation group and 101 in the usual care group. The authors did not report the baseline characteristics of the patients in both groups.

**Study design**
The study was a randomised controlled trial. It was unclear how many centres were involved in this study. Randomisation was carried out in a random fashion, and further details of the randomisation and allocation procedures were reported elsewhere (Griffiths et al, see Other Publications of Related Interest). The groups were followed up for one year. Sixteen to 17 patients completed each programme, but the overall loss to follow-up during the total study period was not reported.

**Analysis of effectiveness**
The analysis was conducted on an intention to treat basis. The outcomes used were:

- quality of life, as measured using the medical outcomes survey Short Form 36 item questionnaire (SF-36) before randomisation, at the end of the 6-week intervention period, and 12 months after entering the study; and
- the death rate during the 1-year follow-up period.

It is not possible to say whether the groups were shown to be comparable at analysis, as the authors did not provide the baseline characteristics of the patients in both groups. It is probable that these were reported elsewhere (Griffiths et al., see Other Publications of Related Interest).

**Effectiveness results**
The SF-36 scores were reported elsewhere (Griffiths et al., see Other Publications of Related Interest).

The derived SF-6D utility scores for the control group were 0.34 (+/- 0.08) before the intervention, 0.37 (+/- 0.09) at 6 weeks after entering the study, and 0.4 (+/- 0.09) at 12 months after entering the study.

The corresponding scores for the outpatient rehabilitation group were 0.33 (+/- 0.08) (before intervention), 0.43 (+/- 0.10) (6 weeks) and 0.4 (+/- 0.11) (12 months), respectively.

Six of the 99 patients in the rehabilitation group and 12 of the 101 patients in the control group died during the study.

**Clinical conclusions**
Patients in the rehabilitation group had a lower mortality rate than those in the control group. They also had higher utility scores 6 weeks after entering the study.

**Measure of benefits used in the economic analysis**
The measure of health benefits used was the quality-adjusted life-years (QALYs). The SF-36 scores measuring health status on eight different scales were converted to a single "preference based" utility score, which indicated the value that would be given to their health state by the general population. This was achieved by extracting the appropriate SF-36 responses and using them to complete a 6-item health state classification, the SF-6D. The SF-6D utility score was combined with survival data to produce QALYs.
**Direct costs**
The resource quantities and the costs were not reported separately in this study, although resource use and differences in resource use between the two groups were reported by Griffiths et al. (see Other Publications of Related Interest). The direct costs included in the analysis were those of the primary and secondary care health services and those of the patient. Data relating to the costs to the health service of providing the rehabilitation programme were gathered from the staff involved in managing the service provision, and staff from the finance department of the NHS trust. All direct costs were allocated to an individual 6-week programme and it was assumed that there was no difference in the costs of delivering each 6-week period. The transport cost was based on the estimate of cost provided by the local ambulance trust. At the end of the 1-month follow-up study, proformas were circulated to the patients’ general practitioners. These recorded the number of consultations at the surgery, the number of home visits, and the number of contacts with other primary care staff. The information systems of the base hospital and six other district hospitals were interrogated for patient admissions.

Patient costs incurred in attending the programme were collected from a questionnaire distributed to the patients. Given that only a few patients indicated a cost, a proxy for patient costs was based on the average mileage. Discounting was not relevant since the costs were incurred during one year and, hence, was not performed. The study reported the average costs. The price year was not reported.

**Statistical analysis of costs**
Due to the incremental cost-utility ratio having an unknown distribution, and the necessity to estimate the sampling distribution around the point estimate non-parametrically, 1,000 further hypothetical incremental costs and utilities were modelled using bootstrap techniques. Significance appears to have been set at a p-value of less than 0.05.

**Indirect Costs**
No indirect costs were included in the analysis.

**Currency**
UK pounds sterling (£).

**Sensitivity analysis**
No sensitivity analysis was performed.

**Estimated benefits used in the economic analysis**
Significantly more QALYs were generated in the rehabilitation group (0.381 +/- 0.01) than in the control group (0.351 +/- 0.08), (p=0.03).

**Cost results**
The cost to the National Health Service of providing each rehabilitation programme was 12,120.

The mean cost per patient was 1,674 (+/- 1,588) in the rehabilitation group versus 1,826 (+/- 3,295) in the control group (p=0.68).

**Synthesis of costs and benefits**
The costs and benefits were combined by calculating an incremental cost-utility ratio (i.e. the additional cost required per QALY gained). The results from the bootstrap exercise indicated that the probability of the true incremental cost-utility ratio of the programme being below 0 per QALY was 0.64. The probability that the true cost per QALY was below 3,000, 10,000 and 17,000 were, respectively, 0.74, 0.90 and 0.95.
Authors' conclusions
The authors concluded that it seemed reasonable to say that the outpatient rehabilitation programme was cost-effective, as it produced cost per quality-adjusted life-year (QALY) ratios within the bounds considered to be cost-effective.

CRD COMMENTARY - Selection of comparators
The comparator used was justified on the grounds that it represented current practice in the authors' setting. You should decide if this is a widely used health technology in your own setting.

Validity of estimate of measure of effectiveness
The basis of the analysis was a randomised controlled trial. This was appropriate for the study question as well-conducted randomised controlled trials are the ‘gold’ standard study design when comparing different health technologies. Since this study was based on a published study, the authors gave only brief details of the methodology used and referred the reader to their previous study. Despite this, it would appear that the study was internally valid as the sample size was large, randomisation was undertaken in a random fashion, and the analysis was conducted on an intention to treat basis. It would have been desirable if the authors had briefly reported whether the baseline characteristics of the two groups were comparable.

Validity of estimate of measure of benefit
The estimation of benefits was obtained directly from the effectiveness analysis. Health status was measured using the SF-36, which has been validated for use in patients with COPD. The authors extracted the appropriate responses and used them to complete a 6-item health state classification (SF-6D), then derived preferences for the general population.

Validity of estimate of costs
All the categories of cost relevant to the perspectives adopted appear to have been included in the analysis, as were all the different costs in each category. The costs and resource use were not reported separately. However, resource use for each group was reported elsewhere (Griffiths et al., see Other Publications of Related Interest). The unit costs were derived from a variety of different sources. Uncertainty in the costs was then appropriately tested using 1,000 bootstrap cycles. Discounting was unnecessary since all the costs were incurred during one year.

Other issues
The authors made appropriate comparisons of their findings with those from other studies that found that pulmonary rehabilitation also had a positive impact on the quality of life of patients. However, the authors were not aware of any study that had directly addressed the overall cost-effectiveness of adding a rehabilitation programme to the standard care. The authors did not address the issue of generalisability to other settings. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis.

The authors reported a number of further limitations to their study. First, the single score measure of utility was relatively insensitive compared with the large changes seen in multidimensional disease-specific health status measures. Second, the follow-up time was short and only allowed for differences in the first year of follow-up, thus neglecting any ongoing effect on QALYs obtained by the differential death rate in subsequent years. In addition, the authors chose to use 17 patients as the baseline, whereas programmes were set up to provide rehabilitation for 20 patients. Finally, the control group comprised patients who were on the rehabilitation waiting list having had treatment reviewed and optimised. The authors pointed out that these limitations would make their findings err on the conservative side, making the rehabilitation programme look less cost-effective.

Implications of the study
The authors recommended that further work should be carried out to assess the utility profile and mortality rate of rehabilitated patients in the medium to long term.
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Other publications of related interest


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