Home-based cardiac rehabilitation versus hospital-based rehabilitation: a cost effectiveness analysis


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
The study examined home- versus hospital-based cardiac rehabilitation in patients with an uncomplicated acute myocardial infarction and without major co-morbidity. Home-based cardiac rehabilitation consisted of a nurse-facilitated, self-help package of 6 weeks' duration (the Heart Manual). Hospital-based rehabilitation was provided to a group of 8 to 10 patients by a team that included a specialist nurse, physiotherapist or exercise therapist, and an assistant clinical psychologist. The patients attended between 8 and 10 sessions (1 session per week).

Type of intervention
Rehabilitation.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients with an uncomplicated acute myocardial infarction and without major co-morbidity.

Setting
The settings of the analysis were the community and a hospital. The economic study was carried out in the UK.

Dates to which data relate
The clinical and economic data were derived from a study published in 2007. The costs were expressed as 2002/03 prices.

Link between effectiveness and cost data
The costing was carried out prospectively on a sub-sample of patients included in the analysis of effectiveness.

Study sample
A sample of 104 patients was enrolled in the clinical trial. There were 60 patients in the home-based rehabilitation group and 44 in the hospital-based rehabilitation group. No details of the demographic or clinical characteristics of the enrolled patients were provided.

Study design
This was a prospective, open, randomised clinical trial. The length of follow-up was 9 months. After randomisation, 12 patients crossed over from the home to the hospital group, and 6 patients crossed the other way. Other data on the
design of the study were not reported, and readers were referred to the primary study.

**Analysis of effectiveness**
The primary clinical end point used in the current economic evaluation was health-related quality of life (QoL). This was estimated using the EuroQol (EQ-5D), as completed by patients at baseline and 3 and 9 months. The number of patient deaths was also observed. At the end of follow-up, EQ-5D data were available for 54 (of 60) patients in the home-based group and 35 (of 40) patients in the hospital-based group. The analysis of the clinical data was conducted on an intention to treat basis. The baseline comparability of the study groups was not discussed, but patients had similar EQ-5D values at baseline.

**Effectiveness results**
No statistically significant difference in the number of patient deaths was observed between groups, (p=0.58).

The mean utility values for the home and hospital groups were comparable at baseline (0.76 +/- 0.02 versus 0.74 +/- 0.03; p=0.351) and 9 months (0.74 +/- 0.04 versus 0.78 +/- 0.04; p=0.57).

The authors noted that, while there was a small increase in utility values from baseline to the end of follow-up in the hospital-based group, a small decrease was found for the home-based group. However, none of these differences reached statistical significance.

**Clinical conclusions**
The effectiveness analysis showed that the two rehabilitation options were comparable.

**Measure of benefits used in the economic analysis**
The summary benefit measure was the quality-adjusted life-years (QALYs). These were calculated as the area under the curve of the EQ-5D observations. Deaths were considered as zero values in utility terms. No discounting was performed, which was appropriate given the short time horizon of the analysis.

**Direct costs**
The analysis of the costs was conducted from the perspective of the NHS and the patients. The items it included were cardiac nurse for home-based rehabilitation (time and travel costs), hospital staff, hospital equipment and manuals, drugs, diagnostic tests, hospital readmissions, revascularisation procedures, primary care contacts, and patient expenses (travel, parking and exercise equipment). The unit costs were presented separately from the quantities of resources used for most items. Resource use was derived directly from the sample of patients included in the clinical trial, using a diary of time spent with each patient (only in the home-based group) and a standard pro forma at each follow-up visits (for other items). A “bottom-up” approach was used in the base-case to estimate staff costs for hospital-based rehabilitation. However, economic data were available for 48 and 32 patients, respectively in the home- and hospital-based groups. No differences were found in age or gender between those with completed and uncompleted economic data. The costs were estimated using standard NHS costs as well as local costs. Discounting was not relevant given the short timeframe of the analysis. The costs were expressed as 2002/03 prices.

**Statistical analysis of costs**
Cost-differences between the groups were analysed using Student’s t-test. Confidence intervals (CIs) around the cost-differences were calculated using the non-parametric bias-corrected bootstrapping method. Missing cost data were imputed using conditional regression methods.

**Indirect Costs**
Productivity costs were not considered.
Currency
UK pounds sterling (%). The costs were converted to euros (EUR) at a rate of 1 = EUR 1.48 (September 2005).

Sensitivity analysis
A deterministic sensitivity analysis was carried out to evaluate the robustness of the cost-utility ratios to variations in the data imputation approach, a "top-down" approach to estimate hospital-based rehabilitation costs, a national cost estimate for hospital-based rehabilitation, per protocol analysis, the inclusion of patient costs, and adjustment for baseline age and gender. Bootstrapping (1,000 replications) was carried out to determine CIs around the cost-effectiveness ratios.

Estimated benefits used in the economic analysis
The mean QALY gain was 0.74 (+/- 0.03) in the home-based group and 0.81 (+/- 0.03) in the hospital-based group. The difference of -0.06 (95% CI: -0.15 to 0.02) did not reach statistical significance, (p=0.156).

Cost results
When considering only resources associated with rehabilitation, the mean cost per patient was 170 (+/- 8) in the home-based group and 200 (+/- 3) in the hospital-based group. The difference of -30 (95% CI: -45 to -12) was statistically significant, (p<0.0001). The difference was primarily due to reduced personnel costs.

However, the mean total costs per patient were 3,279 (+/- 374) in the home-based group and 3,201 (+/- 443) in the hospital-based group. The difference of -78 (95% CI: -1,103 to 1,191) did not reach statistical significance, (p=0.894).

Synthesis of costs and benefits
A synthesis of the costs and benefits was not performed given that there was no statistically significant difference in either the costs or QALYs between groups.

Bootstrapping revealed that simulations ranged from small QALY gains at lower costs for hospital-based rehabilitation to small QALY gains at small lower costs for home-based rehabilitation. However, it should be noted that the majority of the simulations were included in the quadrant of dominance for the hospital-based strategy (less costly and more effective).

The sensitivity analysis did not alter the conclusions of the base-case analysis, regardless of the alternative scenario considered.

Authors' conclusions
The two types of cardiac rehabilitation were similarly effective and expensive from the perspectives of the National Health Service (NHS) and the patient.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparators was clear in that the conventional rehabilitation approach was compared with the new option. A detailed description of both strategies was given. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness evidence came from a clinical trial, which was appropriate for the study question and is usually associated with high internal validity. There was limited information on the design and other characteristics of this trial since the study had been published elsewhere. The authors stated that a potential weakness of the analysis was the lack
of responsiveness of the EQ-5D, which was insensitive to changes in the patients' QoL despite other clinical end points used in the primary trials showing improvements in both groups. Another potential limitation of the study was the small sample size, as this might not have had sufficient statistical power to detect true differences in the clinical results.

Validity of estimate of measure of benefit
The benefits (QALYs) were estimated directly from the clinical trial. The use of QALYs was appropriate given the impact of the interventions on QoL. The approach used to calculate the QALYs was described. QALYs have the additional advantage that they can be directly compared with the benefits of other health care interventions.

Validity of estimate of costs
The analysis of the costs included all cost categories relevant to the perspective adopted in the study. Although productivity costs were not considered, some costs borne by the patients were included. A breakdown of the cost items was provided. Extensive information on the unit costs and quantities of resources was provided, which enhances the possibility of replicating the analysis in other settings. Sources of the costs were reported for each item. Extensive statistical analyses were carried out to deal with the significance of cost-differences and missing data. The authors carried out an accurate evaluation of costs using both a bottom-up and a top-down approach. The price year was given, thus facilitating reflation exercises in other time periods. The authors pointed out that the economic study was likely to have been underpowered to detect statistically significant differences in total costs because a large proportion of patients did not provide adequate data on resource use.

Other issues
The authors reported the results from another study and stated that similar findings were observed. However, there were few published economic evaluations comparing the two rehabilitation strategies. The issue of the generalisability of the study results to other settings was not explicitly addressed, but some sensitivity analyses were carried out to consider alternative assumptions on costs and clinical data. The study referred to patients requiring cardiac rehabilitation and this was reflected in the authors' conclusions. The authors noted some limitations of the analysis, which have been highlighted already. In general, although the two rehabilitation programmes showed no statistically significant differences in costs and benefits, it might have been interesting to have seen the probability of hospital-based rehabilitation being cost-effective at different threshold values. Hospital-based rehabilitation turned out to be dominant in most of the simulations, but the authors did not provide extensive information around this, such as, for example, a cost-effectiveness acceptability curve.

Implications of the study
The study results suggest that further research on the most cost-effective cardiac rehabilitation settings is required.

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