New East-Westfalian postoperative therapy concept: a telemedicine guide for the study of ambulatory rehabilitation of patients after cardiac surgery


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 authors studied telemedicine-based rehabilitation used in the home, supported by the use of an electronically regulated bicycle ergometer (Type AX-1; Kettler Company, Ense-Parsit, Germany). Cardiovascular function was recorded by a mobile telemedicine unit (9-channel electrocardiogram with heart rate monitor) and then transmitted telephonically. This was compared with the usual in-hospital rehabilitation.

Type of intervention
Other: Rehabilitation following cardiac surgery.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who had undergone cardiac surgery within the study setting. Patients were excluded if they had a postoperative left ventricular ejection fraction of less than 30%, had malignant arrhythmia, or were younger than 18 years of age.

Setting
The setting was inpatient and outpatient care. The economic study was carried out in Germany.

Dates to which data relate
The effectiveness and resource use data were collected between November 2000 and October 2001. A price year was not explicitly reported, but the prices would seem to relate to the same time period.

Link between effectiveness and cost data
The costing was carried out prospectively on the same sample of patients as that used in the effectiveness study.

Study sample
The study sample was selected by including patients who had undergone cardiac surgery in the study setting. A total of 170 patients were divided into two groups. Of these, 100 received telemedicine (95.7% male) and 70 received traditional inpatient care (90.0% male). The mean age of the patients was 57.6 (+/- 8.4) years in the telemedicine group and 55.2 (+/- 11.2) years in the inpatient care group. No patients were reported to have refused consent. However, many refused to be randomised to telemedicine and this factor determined the design of the study.

Study design
The authors designed a non-randomised controlled trial in which patients self-selected into one of the rehabilitation groups. The analysis was based at a single inpatient facility and at multiple patient homes for the outpatient rehabilitation group. Blinding was not possible given the nature of the study. The patients were followed for 12 months, with the rehabilitation period lasting 3 weeks in the inpatient rehabilitation group and 3 months in the telemedicine group and with follow-up at 6 and 12 months post-surgery in both groups. There was no loss to follow-up apart from the single individual who died and was excluded.

Analysis of effectiveness
The primary health outcomes were electrocardiogram and spiroergometry measurements, body weight and heart rate, and quality of life. Quality of life was measured using the Short form-36 (SF-36) questionnaire, which is an 8-dimension questionnaire assessing subjective health. The questionnaire was completed at baseline and at 6 and 12 months after surgery. Although not explicitly reported, all the patients that were alive at the end of the study were included in the analysis. The groups were compared extensively at baseline and a significant difference was found only in overall health.

Effectiveness results
Changes in body mass index at 6 and 12 months were not statistically significant over time within groups. Differences between the groups in terms of physical capacity and change in heart rate were not statistically significant.

At the 6-month follow-up, the inpatient group showed a statistically significant increase in physical capacity and physical role function. The telemedicine group had statistically significant increases in all dimensions of the SF-36 questionnaire.

Clinical conclusions
The authors concluded that "results at 6 months and 12 months after surgery demonstrate that physical activity parameters in both groups were comparable".

Measure of benefits used in the economic analysis
There was no summary measure of benefit. In effect, a cost-consequences analysis was performed.

Direct costs
A perspective for the cost analysis was not reported. The costs of inpatient rehabilitation were based on the standard daily rates for the relevant hospital. The authors did not report exactly what was included in their daily rate, for instance whether staffing rates or overheads were included. The analysis took all specialist tests and equipment used during rehabilitation into consideration. For example, the costs of telemedicine covered the telemedicine connection, the home ergometer and transport of the ergometer. Discounting was not required because of the relatively short time horizon of the study. The unit costs were reported separately and the authors clearly set out a timeline of events faced by patients in each of the study groups for costing.

Statistical analysis of costs
The authors used Fisher's exact test for non-interval-scaled data, the Mann-Whitney U-test for interval scaled data (non-normally distributed) and the Kolmogorov-Smirnov test d for normally distributed variables. A one-way analysis of variance was used to assess time-dependent effects in each group. The results were presented as the mean +/- standard deviation and p-values of less than 0.05 were considered significant.

Indirect Costs
Productivity costs were not included in the analysis.
Currency
Euros (EUR).

Sensitivity analysis
No sensitivity analyses were performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The authors estimated the total costs to be EUR 2,421 for the inpatient group and EUR 1,032 for the telemedicine group.

The latter estimate (telemedicine group) was stated to exclude the costs of transportation incurred by the patient, which were thought to be approximately EUR 0.72 to EUR 72.00 per examination.

Synthesis of costs and benefits
The cost and benefits were not synthesised.

Authors' conclusions
Quality of life was improved equally in both groups although, in the telemedicine group, this improvement was statistically more significant. This technology could lead to significant cost-savings.

CRD COMMENTARY - Selection of comparators
The authors compared the standard practice of inpatient rehabilitation with the relatively new alternative of telemedicine-based rehabilitation, for which they noted there is little established evidence.

Validity of estimate of measure of effectiveness
The authors designed a non-randomised study. This type of study does not help to control for potentially systematic differences and, therefore, potentially confounding factors. The study sample was representative of the study population and the authors clearly compared the groups at baseline, showing there to be few differences between them.

Appropriate statistical analyses were carried out to compare outcomes in the two groups and to assess whether the outcomes were statistically significant.

Validity of estimate of measure of benefit
There was no summary measure of benefit. In effect, a cost-consequences analysis was conducted.

Validity of estimate of costs
Although the authors did not report a perspective for the analysis they seem to have adopted the perspective of a health care provider (e.g. the hospital). Indeed, they explicitly stated in their results that costs incurred by the patient were excluded. Costs relevant to the hospital (such as the costs of examinations) were included, although it was unclear exactly what was included in the hospital daily rate used. If a broader perspective such as society were adopted in future, the authors should also consider the costs to the individual and productivity losses (from the patient and carer) and gains incurred, as these may have a significant impact on the overall results and conclusions.
Other issues
Despite limited evidence in this area, the authors were able to make some comparisons with two US studies that reported similar improvements in physical capacity. The results were clearly presented and were relevant to the scope of the study. The conclusions were an accurate reflection of the results presented. The issue of generalisability was not addressed but it will be limited by the local nature of the costs used, although it might have been improved by the use of sensitivity analysis to explore the implications of parameter variability. Several limitations were noted, for instance the lack of randomisation and the different durations of the two rehabilitation programmes.

Implications of the study
The authors recommended that "an intensified increase of ambulant rehabilitation...can be considered to be helpful". In addition, they suggested that three factors contributed to the effectiveness results, namely the physical exercise programme, repeated control examination and supervision using telemedicine. The authors recommended further work to delineate the influence of each of these factors.

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Other publications of related interest
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