The economic impact of a multifactorial intervention to improve postoperative rehabilitation of hip fracture patients
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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
The use of a multifaceted intervention (MI) for the rehabilitation of patients after a hip fracture. The intervention consisted of supportive in-hospital patient education, high-intensity strength training, an at-home walking programme, and contact with peer advocates who had experienced the same problem and had recovered satisfactorily.

The in-hospital patient education consisted of a brief video where a peer advocate explained her recovery and encouraged intervention patients to complete the strength training. The study protocol established that each patient should receive 16 training sessions.

Type of intervention
Rehabilitation.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients aged 65 years or older with a hip fracture.

Setting
The setting was both a hospital and the community. The economic study was carried out in New York (USA).

Dates to which data relate
The dates to which the effectiveness and resource utilisation data related were not reported. The price year was 1995.

Source of effectiveness data
The effectiveness data were derived from a single study.

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

Study sample
The sample size to be recruited was 180 patients, 90 for each one of the alternative strategies. The authors did not report that this sample size was determined to assure a certain power. The eligible patients were those aged 65 years and older, who were admitted for a hip fracture in the hospitals in which the study was carried out.
Patients were excluded from the study sample if:

- they were unable to give informed consent at the fourth or fifth postsurgical day or to give responses to the Folstein Mini-Mental State Exam;
- their hip fracture was pathologic (i.e. secondary to malignancy);
- they were non-English speakers;
- exercise was contraindicated (for example, if they had critical aortic stenosis, unstable angina or end-stage cardiomyopathy) or their primary physician believed that exercise was contraindicated for them;
- they did not have telephone access or could not be reached by telephone; or
- they intended to relocate after discharge.

The target figure of 180 was not achieved and only 152 patients were recruited from the eligible patients. Among those patients, 114 agreed to participate in the study. The final study sample was made up of 59 patients in the MI group and 55 in the SPC group. To generate cohorts of comparable size the control group was inflated by a factor of 1.0727, increasing the number to 59. The authors did not report evidence that the study sample was representative of the study population.

**Study design**

The study was a multi-centred, randomised controlled trial conducted in three hospitals. The patients were randomised using tables of random numbers that were balanced at intervals. Only the study statistician was aware of the balancing of the intervals. The duration of the study was 3 years. The patients were followed up over 6 months for the clinical study, although the period of follow-up was 18 months for calculation of the costs. It was not stated clearly whether the patients were blinded to the strategy to which they had been allocated.

**Analysis of effectiveness**

The authors reported that the analysis of the clinical study was conducted on an intention to treat basis. The health outcomes assessed in the effectiveness study were:

- the number (and percentage) of patients in the MI group who received any strength training session,
- the median number of sessions received by these patients,
- the number (and percentage) of patients in the MI group who saw the self-efficacy-oriented video, and
- the number (and percentage) of patients who had at least one contact with a peer advocate.

The authors also documented the change occurring between baseline and the 6-month follow-up in the physical role limitation, the physical functioning and the social functioning components of the SF-36 for both patient groups (MI and SPC). The groups were shown to be comparable in terms of the age, educational attainment, gender, marital status, race, religion, residence (community or nursing home) and self-reported health status, (p>0.05). Self-reported health status was measured by the general health, mental health, physical functioning and social functioning components of the SF-36.

**Effectiveness results**

Only 35 patients (59%) in the MI group received any strength training session, and the median number of sessions received by these patients was 12. The video was seen by 42 patients (71.2%), and 24 patients (40.7%) had at least one contact with a peer advocate.
The change occurring between the baseline and 6-month follow-up in the physical role limitation component of the SF-36 was significantly higher for the MI patients (66.1) than for the SPC patients (38.9), (p=0.02).

The physical functioning score was 46.3 for the MI patients and 38.9 for the SPC patients, (p>0.05).

The social functioning score was 44.2 for the MI patients and 39.4 for the SPC patients, (p>0.05).

Clinical conclusions
Patients in the MI group did not comply fully with the intervention protocol established at the beginning of the study. The improvements in the physical role limitation score were higher among those patients receiving MI than among those receiving SPC. When physical functioning and social functioning were considered, there were non significant differences in the improvements experienced by the MI and SPC patients.

Methods used to derive estimates of effectiveness
A panel of experts consisting of health professionals from different disciplines was created. The panel's objective was to determine, among those patients with hospital stays that exceeded 90 days, which component of the stays was attributable to the patients' hip fracture.

Estimates of effectiveness and key assumptions
The authors did not derive any estimate of effectiveness from the expert panel. Instead, they considered the duration of hospital stay directly attributable to the patients' hip fracture (determined by the expert panel) in the calculation of the costs.

Measure of benefits used in the economic analysis
The authors did not report a summary measure of health benefit. The study was therefore categorised as a cost-consequences analysis.

Direct costs
The resource quantities and the costs were reported separately. Resource utilisation was assessed from a telephone questionnaire conducted with the patients. For those patients who could not recall the amount of resources used, their resource utilisation was proxied at the median amount of care used during the study period. The direct costs included in the analysis for the MI and SPC groups were those related to the health service. These were for both the direct medical care and non-medical (community-based) care. The direct medical costs comprised the cost of office-based and outpatient clinic physician care, emergency room care, acute hospital care, post-hospital discharge rehabilitation care in a long-term facility, nursing home care, radiological and laboratory tests that were not part of the hospital stay, physical and/or occupational therapy, visiting nurse care and prescription drugs. The direct non-medical costs included homemaker assistance and transportation costs. The authors also included the costs related to informal care, that is, the non-paid assistance provided by the patient's family or friends in relation to tasks of daily living. Informal care was included if the help was related specifically to the hip fracture and not to other unrelated conditions. For the MI group, the programme costs were also included. These related to the training of the peer advocates, the strength training, the broadcasting of the video and the peer advocate time.

The costs were estimated using actual data. Personnel time was valued on the basis of the average salaries prevailing in one of the hospitals in which the study was carried out. Medicare reimbursement rates were used as a proxy for physical therapy costs, while the prevailing costs in the community were used for services not covered by Medicare. Peer advocate time and informal care were valued using the federal minimum wage.

The authors reported that 12 patients were followed up for only 12 months. For those patients, the costs were projected for the 18-month period. For patients remaining hospitalised for more than 90 days, a panel of experts determined which stays were attributable to the patients' hip fracture. Formal help associated with activities of daily living was
included in the study when it was specifically attributable to the hip fracture, but not when it was related to a separate condition.

Discounting was performed because the study period was 3 years. A 3% discount rate was considered, following the recommendations of The Panel on Cost-Effectiveness in Health and Medicine. The study reported the average costs per patient. The price year reported was 1995.

The discounted total savings generated by MI were calculated as the difference between the discounted total costs of patients in the SPC group and those in the MI group. To facilitate comparisons between the costs generated by the MI and the SPC groups, the number of individuals in the SPC group was inflated by a factor of 1.0727, making the number of patients in each group equal to 59. Two ratios were reported. One indicated the savings generated by MI over the costs of MI. The other, being defined as the net present value (NPV) of the intervention MI, considered the net savings generated by MI once the costs of the interventions had been subtracted. This latter ratio indicated the actual magnitude of the savings.

**Statistical analysis of costs**
All the means and standard deviations for resource use and related costs were reported. Statistical analyses of the costs were performed to test for significant differences between the costs related to the MI and the SPC groups.

**Indirect Costs**
The costs related to lost productivity were not included since the study was conducted on an older population.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were carried out to investigate variability in the data. Informal care was valued at the market wage for the services provided, as opposed to the federal minimum wage used in the analyses. A 5% discount rate was used to analyse the robustness of the findings when another of the discount rates reported in the literature was considered.

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

**Cost results**
The cost related to the training of the peer advocates, the strength training, the broadcasting of the video and the peer advocate time was $722 per patient.

The average total cost per patient was $13,842 under the MI strategy (standard deviation, SD=$11,941), and $17,139 under the SPC strategy (SD=$21,577).

The authors reported that none of the actual utilisation and cost category differences between patients in the MI and the SPC groups were significant, (p>0.05).

The total cost of the programme intervention was $42,593. The total savings of MI, compared with SPC, were $194,527 ($66,799 corresponding to direct medical savings and $127,725 corresponding to direct nonmedical savings).

The ratio calculated as the savings generated by MI over the costs of MI gave a value of 4.57. Since the ratio was greater than one, it meant that the savings of MI exceeded the costs that the intervention implied.

The NPV of MI was $150,974.
**Synthesis of costs and benefits**

No summary of the health benefit was stated, but the authors reported an incremental cost-effectiveness profile based on the physical role limitation improvement. When only the programme costs were included, the incremental cost-effectiveness profile per point of improvement was $1,566.

The sensitivity analyses showed that the findings were not sensitive when variations in the discount rate and in the method of valuing informal care were considered.

**Authors’ conclusions**

Compared with patients receiving standard postoperative care (SPC), there was a significant improvement in the physical role limitation among patients receiving the multifaceted intervention (MI). The savings generated by the MI exceeded the costs of the programme. The authors concluded that the findings suggested that MI was of economic merit.

**CRD COMMENTARY - Selection of comparators**

The comparator used was justified on the grounds that it was the standard care for the patient population under analysis. However, a limitation in relation to the comparator was that the authors did not explicitly specify what SPC consisted of. You should decide if SPC represents a valid comparator in your own setting.

**Validity of estimate of measure of effectiveness**

The analysis used a randomised controlled trial, which was appropriate for the study question. The authors did not show that the patients were representative of the study population, but the fact that the study included patients from three different hospitals may have increased the chance that the study sample represented the study population. The patient groups were shown to be comparable at baseline analysis. The authors reported limited information on the effectiveness outcomes generated by both strategies. It was not stated why the effectiveness data were reported only for the changes that occurred between the baseline and 6-month follow-up, and not for the 18-month follow-up considered in the costing.

**Validity of estimate of measure of benefit**

The authors did not report any summary measure of benefit. Therefore, the analysis was categorised as a cost-consequences analysis. However, the physical role limitation improvement was used to calculate an incremental cost-effectiveness profile ratio. This was an arbitrary choice that was not justified by the authors. The implicit justification of using this health outcome may have been that it was the only health outcome showing a significant improvement of the MI in comparison with SPC.

**Validity of estimate of costs**

The authors reported that a societal perspective was adopted, but the indirect costs (for example, lost productivity) were not included. This exclusion was justified on the grounds that the study population comprised an older population. Moreover, the authors reported that, in the case of including the indirect costs, the savings generated with MI would have been even greater, thus reinforcing the findings of the study. It appears that all the relevant direct costs were included in the analysis. The resource utilisation and the costs were reported separately, which enhances the generalisability of the results to other settings. Statistical analyses of the quantities and the costs were performed. The price year was given. However, the reliability of the cost results depended greatly on how accurately the patients and the expert panel reported resource utilisation. The authors reported that clinical records were used to validate some of the cost data, and this helped to increase the reliability of the conclusions. The authors reported total savings of MI over SPC. They argued that the advantage of doing this rested on the fact that it reported a value for money expended, this being a concept of increasing concern for the management of care organisations.
Other issues
The authors did not make appropriate comparisons of their findings with those from other studies. Also, they did not address the issue of generalisability to other settings. The authors provided limited justification as to why the patients were followed up for 6 months for the clinical study and for 18 months for the costing analysis. The small sample size may have limited the significance of the differences between both patient groups, although the authors noted this as a general problem with economic evaluations conducted alongside side clinical trials.

Implications of the study
Although, at the aggregate level, MI generated savings in comparison with SPC, non significant differences were found at the individual level when the resource utilisation and costs were considered. The effectiveness outcomes reported were very limited. The authors suggest further investigation to test whether MI is a cost-effective intervention when compared with SPC using a larger sample size.

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Other publications of related interest
Kiel DP, O'Sullivan P, Teno JM, Mor V. Health care utilisation and functional status in the aged following a fall. Medical Care 1991;29:221-8.


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