Effect of adjunctive range-of-motion therapy after primary total knee arthroplasty on the use of health services after hospital discharge

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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
Three approaches for the rehabilitation of patients who had undergone primary total knee arthroplasty were examined. These were continuous passive motion (CPM) with standardised exercises (SEs), slider-board (SB) therapy with SEs, and SEs alone. SEs consisted of 30-minute sessions with the physical therapist from the third postoperative day. SB therapy consisted of one 10-minute per day session during the SE period starting from the second postoperative day. CPM began on the second postoperative day with the patients instructed to receive three 2-hour CPM sessions each day until discharge.

Type of intervention
Rehabilitation.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who had undergone primary total knee arthroplasty. Those receiving a unicompartmental knee replacement were not considered eligible.

Setting
The setting was a tertiary care centre. The economic study was conducted in Canada.

Dates to which data relate
The effectiveness and resource use data were gathered from June 1997 to July 1998. The prices were estimated in 1997/1998 values.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

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

Study sample
Power calculations were performed in the planning phase of the study. The sample was powered to detect a statistically significant difference of 5 degrees of knee ROM among the three groups with 80% power (this was one of the outcome measures used in the Beaupre et al. study, which focused explicitly on the clinical outcomes of the
interventions under evaluation). A sample of 120 eligible individuals, who were willing to return for the required visits and gave informed consent, was enrolled consecutively in the study from 12 surgeons' practices. There were 40 participants in each group. The mean age was 69 (+/- 8) years in the CPM group, 68 (+/- 9) years in the SB group, and 68 (+/- 9) years in the SE group. The proportion of female patients was 30% (CPM), 50% (SB), and 53% (SE), respectively.

**Study design**
This was a prospective, randomised clinical trial that was conducted at a single centre, the University of Alberta Hospital in Edmonton (AB), Canada. Randomisation was conducted using consecutively numbered, sealed, opaque envelopes following the patients' enrolment visit. The patients were assessed by a physical therapist who was blinded to the group allocation. The length of follow-up was 6 months postoperative. After a mean hospital stay of 7 days post-total knee arthroplasty, the patients were discharged home or transferred to another facility for further rehabilitation. No loss to follow-up was reported.

**Analysis of effectiveness**
The analysis of the clinical study was conducted on an intention to treat basis. The outcome measure used was the number of complications experienced after discharge (range-related, joint-related, and unrelated). As already reported, other clinical outcomes had been assessed in the prior analysis (Beaupre et al.). The study groups were comparable at baseline in terms of their demographics, clinical and acute hospital care characteristics.

**Effectiveness results**
The number of complications experienced after discharge was:

5 (3 range-related, 1 joint-related, and 1 unrelated) in the CPM group,

4 (2 range-related, 2 joint-related, and 0 unrelated) in the SB group, and

6 (2 range-related, 3 joint-related, and 1 unrelated) in the SE group.

The differences between the groups did not reach statistical significance.

**Clinical conclusions**
The effectiveness study showed that the complication rates did not differ across the groups.

**Measure of benefits used in the economic analysis**
No summary benefit measure was used in the economic analysis because there was no difference in the clinical outcome or complication rates among the three groups at 6 months. Therefore, a cost-minimisation analysis was carried out.

**Direct costs**
Discounting was not relevant since the costs were incurred during 6 months. The unit costs were not presented separately from the quantities of resources used. The health services included in the economic evaluation were transfers and readmissions, home care, and outpatient therapy. The quantities of resource use were reported in detail for each study group. The cost/resource boundary of the regional health authority was adopted. Resource use was estimated using actual data derived from the same sample of patients as that used in the effectiveness analysis. The cost data were obtained from the administrative databases of the regional health authorities. All the costs were presented in 1997/1998 prices.
Statistical analysis of costs
A one-way analysis of variance was used to test the statistical significance of differences in the total costs.

Indirect Costs
The indirect costs were not included.

Currency
Canadian dollars (Can$).

Sensitivity analysis
A sensitivity analysis was conducted using an alternative series of per diem hospital costs.

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

Cost results
The total costs were:

Can$1,247.8 (+/- 1,173.9) (range: 0 - 4,135) in the CPM group,
Can$1,695.9 (+/- 44.1) (range: 0 - 8,335) in the SB group, and
Can$1,653.4 (+/- 2,659.5) (range: 0 - 11,790) in the SE group.

The difference in costs between the groups did not reach statistical significance, (p=0.53). The use of alternative costs did not change the results of the analysis.

The whole sample was subsequently divided into two groups, those who had 60 degrees' flexion at discharge from hospital and those who did not. It was found that patients with less than 60 degrees' flexion had a longer rehabilitation length of stay and used significantly more health services than those who had attained this goal by the time of hospital discharge.

Synthesis of costs and benefits
A synthesis of the costs and benefits was not relevant since a cost-minimisation analysis was conducted.

Authors' conclusions
The use of adjunctive range of motion therapy, either continuous passive motion (CPM) or slider-board (SB), did not lead to a reduction in rehabilitation costs. The use of health services and the number of complications was comparable across the groups.

CRD COMMENTARY - Selection of comparators
The authors provided a justification for their choice of the comparators. CPM was the standard approach in several settings, while SB represented a new, cheap method they had developed in their centre. Both interventions were then used as adjuncts to SEs. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness evidence was obtained from a randomised trial, which was appropriate for the study question. The study groups were comparable at baseline, which limited the impact of confounding factors. The methods of sample selection and randomisation were reported. Power calculations (referring to the previous study) were reported, although they were not clearly related to the outcome measure used in the current evaluation. The length of follow-up appears to have been appropriate and no patient was lost to the follow-up evaluation. The analysis of the clinical study was conducted on an intention to treat basis. A therapist who was blinded to group allocation evaluated some of the outcomes. The study sample was selected from consecutively identified patients, thus it was representative of the patient population. These issues tend to enhance the internal validity of the analysis.

**Validity of estimate of measure of benefit**
No summary benefit measure was used in the analysis because a cost-minimisation analysis was conducted.

**Validity of estimate of costs**
The perspective adopted in the study was clearly stated and all the relevant categories of costs were considered in the analysis. Only post-discharge costs were included. Details of resource use and the unit costs were not reported separately, which limits the possibility of replicating the study. The source of all the economic data was provided. Similarly, the price year was reported, which makes reflation exercises in other settings easy. Statistical tests of the costs were conducted. The potential impact of baseline factors and the use of alternative costs were also investigated. The authors noted that the study was not powered to detect statistically significant differences in the costs.

**Other issues**
The authors did not compare their findings with those from other studies. However, they noted that the short-term benefits of fewer manipulations and readmissions associated with CPM, which had been reported in other studies, were not observed in their cohort of patients. The authors noted that their findings could be generalisable to other institutions that followed a similar postoperative regimen. The study referred to patients who had undergone primary total knee arthroplasty and this was reflected in the authors' conclusions.

**Implications of the study**
The study results suggested that adjunctive ROM therapy does not affect rehabilitation resource use and costs after primary total knee arthroplasty.

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**Bibliographic details**

**Other publications of related interest**


**Indexing Status**
Subject indexing assigned by NLM