Costs and effectiveness of pre- and post-operative home physiotherapy for total knee replacement: randomized controlled trial

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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
Patients undergoing unilateral total knee replacement (TKR) were given physiotherapy before and after the operation in their own homes. This consisted of a minimum of three home visits preoperatively and up to six visits post-operatively. The comparator treatment was to give patients undergoing TKR standard hospital-based treatment, in which physiotherapy was given postoperatively in a hospital outpatient setting. This consisted of knee classes of 7 to 10 patients in the gymnasium, with individual treatment sessions given at the physiotherapists' discretion, once or twice a week.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients waiting for a unilateral TKR in one city were invited to participate in the study. The patients had to meet two inclusion criteria: orthopaedic surgeon consent to referral of patients on their waiting list, and patient's address within Sheffield community physiotherapy service boundaries. The exclusion criteria were:

- revision procedures;
- bilateral or unicondylar knee replacements;
- total knee replacement following severe trauma;
- onset of serious co-morbidity or terminal illness since patient placed on the waiting list, which necessitates cancellation or considerable delay in treatment; or
- contra-lateral knee replacement within the preceding 12 months.

Setting
The setting was the community and secondary care. The economic study was carried out in Sheffield, UK.

Dates to which data relate
The effectiveness and resource use evidence were from 1999 to 2000. The prices used were from 2001 to 2002.

Source of effectiveness data
The effectiveness data were derived from a single study.
**Link between effectiveness and cost data**
The same patients provided both the effectiveness and the cost data. The costing was carried out prospectively.

**Study sample**
Power calculations were conducted. The sample size was chosen to be 65 in each group (90% power, two-sided significance level \(p=0.05\)), based on an expected mean difference of 1.5 between the two groups in their changes in the Western Ontario McMaster Osteoarthritis (WOMAC) index. Initially, 160 patients gave informed consent, 80 patients in each group. However, 23 patients withdrew from the home group and 22 from the hospital group, and one patient in the hospital group died postoperatively. This left 57 patients in the home group and 57 in the hospital group. From the 45 patients who withdrew (28.1% of the initial sample), 24 (15.1%) had their surgery cancelled, 7 had their operation deferred, 6 did not complete the preoperative questionnaire, 4 no longer fitted study criteria, 2 withdrew postoperatively and 2 died preoperatively.

**Study design**
This was a single-centred randomised controlled trial (RCT) in which a computerised block-randomisation sequence was used to allocate individual patients to the different treatment groups. The patients were followed for a 12-week period and loss to follow-up was reported. The researchers were blinded at the point of analysis. In the end, only 39 (73.6%) patients in the intervention group and 31 (59.6%) in the control group received the allocated treatment.

**Analysis of effectiveness**
The analysis was conducted on an intention to treat basis. The primary health outcome used was the postoperative WOMAC index pain dimension scores 12 weeks after the operation. The secondary outcomes included changes in stiffness and physical function, as measured by the disease-specific WOMAC, changes on dimensions measured by the Short Form 36 Health Survey (SF-36), and satisfaction with treatment. WOMAC dimension scores ranged from 0 - 20 (pain), 0 - 8 (stiffness) and 0 - 68 (physical function), where a higher score indicated increased pain or stiffness or worse physical function. SF-36 dimension scores ranged from 0 - 100, with a higher score for each dimension indicating better health-related quality of life. The SF-6D scores ranged from 0.3 - 1.0, where a higher score indicated good health.

The patient groups were generally similar at baseline, except that patients in the home care group had a significantly longer mean preoperative waiting time than patients in the hospital group (mean difference 5.2 weeks).

**Effectiveness results**
No significant differences were observed between the groups in terms of the postoperative WOMAC index and SF-36 mean scores.

Patients in both groups were equally satisfied (86%) with their treatments, although 64.9% of the home group compared with 47.4% of the hospital group would choose their location for physiotherapy again (difference not statistically significant).

**Clinical conclusions**
The authors concluded that no difference could be detected in the health outcomes examined in the two treatment groups.

**Measure of benefits used in the economic analysis**
The authors did not use a summary measure of benefit in the economic analysis. As therapeutic equivalence was demonstrated in the effectiveness analysis, the study could be characterised as a cost-minimisation analysis.
Direct costs
No discounting was carried out as the costs were incurred during less than two years. The costs and the quantities were analysed separately and were based on actual data. The costs of community physiotherapy visits, general practitioner (GP) consultations, inpatient stay, hospital physiotherapy sessions, ambulance journeys and medical journeys were measured. The costs incurred by the patients were also collected. These costs included transport costs incurred by the patients and other out-of-pocket costs associated with having physiotherapy sessions. The quantity data came from GPs, community physiotherapy and hospital records. The source of the unit costs was local costs when available, otherwise national average costs were used. The cost of the operation was not included as it was common to both groups. The price year used was 2001/02.

Statistical analysis of costs
No statistical analysis of the costs was carried out.

Indirect Costs
No indirect costs were estimated.

Currency
UK pounds sterling (€).

Sensitivity analysis
The effect on physiotherapy costs of reducing community visits by one third was calculated.

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

Cost results
The mean total cost per patient was 5,376 (standard deviation, SD=916) in the home group and 5,372 (SD=832) in the hospital group. The mean difference was -4.7 (95% confidence interval, CI: -334 - 324), (p=0.978).

Physiotherapy services for the intervention group were significantly more costly than for the control group, 197.9 versus 61.5 (mean difference -136.5, 95% CI: -160 - -113; p=0.001).

The hospital group had transport costs, a mean of 38.7 per patient.

The costs were estimated for 12 months before TKR until 12 weeks after the operation.

The effect of reducing community visits by one third meant that the marginal difference in the physiotherapy component of costs for the more expensive home group was reduced to 76.50 (95% CI: -95.1 - -57.8; p=0.001).

It was unclear whether or not the costs of adverse effects were included.

Synthesis of costs and benefits
Not applicable as the study could be characterised as a cost-minimisation analysis.

Authors' conclusions
Although home physiotherapy was as effective and as acceptable to patients as hospital outpatient physiotherapy for unilateral total knee replacement (TKR), the introduction of pre- and postoperative home physiotherapy rehabilitation...
for TKR is likely to be more expensive than usual hospital postoperative physiotherapy treatment in knee classes. Therefore, it would require appropriate resources. Additional preoperative home physiotherapy did not improve patient-perceived health outcomes. The authors suggested that the similarity in patient satisfaction results from a tendency of National Health Service (NHS) patients in the older age group to be satisfied after treatment.

**CRD COMMENTARY - Selection of comparators**
The choice of the comparator, postoperative hospital physiotherapy for TKR, was justified by it representing 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 effectiveness data were derived from a single study and no other source. The study design, an RCT, was appropriate for the hypothesis. However, the choice of the comparator meant that there were two important differences in treatment, the amount of physiotherapy and its location. This meant that it would be difficult to know which element was the cause of any difference in outcome. The study sample was representative of the study population. However, patients who withdrew from the study sample had significantly poorer scores on the SF-36 general health, energy and mental health dimensions and were also significantly more likely to report heart problems and stroke or ischaemic attack. Presumably this kind of patient would have put a higher value on treatment at home than on going to hospital for treatment. The two patient groups were shown to be comparable at baseline.

Power calculations were conducted, and the length of the study and loss to follow-up were reported. The outcomes were analysed on an intention to treat basis and an appropriate statistical analysis was undertaken. These facts suggest that the internal validity of the study is high.

**Validity of estimate of measure of benefit**
As the analysis demonstrated that both treatments were equally effective, only the costs were analysed. A cost-minimisation analysis was conducted.

**Validity of estimate of costs**
From the cost perspective adopted, all relevant categories of cost appeared to have been included. The cost of surgery, which was common to both groups, was not included in the analysis. In addition, it was unclear whether the costs resulting from adverse events had been included. The authors reported that patient costs were also assessed in the study (transport and out-of-pocket costs), but they only reported transport costs incurred by the hospital group and did not discuss the results.

The costs and the quantities were reported separately in a very clear manner, which will enhance the reproducibility of the analysis in other settings. The resource use quantities were taken from a single study and no other source. No statistical analysis of the quantities was carried out, although the effect on physiotherapy costs of reducing the amount of community physiotherapy was analysed. The prices were taken from the authors' setting and from a published source. No statistical, sensitivity or any other kind of analysis of the prices was carried out. The price year was reported, thus aiding future reflation exercises. Discounting was not applied, which was appropriate given the short time horizon of the cost analysis.

**Other issues**
The authors made appropriate comparisons of their results with the findings from other studies. The issue of generalisability to other NHS settings was addressed. The authors did not present their results selectively, but it would have been interesting had they presented the information they collected on patient incurred costs; this would probably have resulted in a cost-advantage for the home group. The study enrolled patients waiting for a unilateral TKR and this was reflected in the authors' conclusions. The authors' conclusions reflected the scope of the analysis.

The authors reported two limitations of their study. First, there were fewer patients than originally planned. Thus, the
study was inadequately powered to detect a difference in 1.5 points, although it could have detected a difference in 2 points in the WOMAC score. Second, the patients and physiotherapists were not blinded to the kind of treatment received.

Implications of the study
The authors argued that the fact that differing amounts of physiotherapy appeared to have no effect on patient outcomes means that further research is necessary to determine the optimal level of physiotherapy. A study which separates out the amount of physiotherapy from the question of its location (home or hospital) would be useful, as would a study examining the costs from a societal perspective and taking the patients' direct and indirect costs into consideration.

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