A comparison of the cost effectiveness of one-stage versus two-stage bilateral total hip replacement

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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
One-stage (one hospitalisation) and two-stage (two hospitalisations) bilateral total hip replacement (THR) procedures were compared in patients with osteoarthritis.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with osteoarthritis who required two hips replacing with prostheses. The criteria used for prosthesis selection, surgical technique, anaesthetic management, auto-transfusion methodology, suction drains, peri-operative nursing care protocol, and post-operative physical therapy protocol remained identical for all patients during the 2-year study period.

Setting
The setting was tertiary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness and resource data related to the 2-year period between January 1991 and January 1993. The authors did not report the price year.

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

Link between effectiveness and cost data
The costing was carried out retrospectively using the same patient sample as that used in the effectiveness study.

Study sample
The sample included all patients who underwent one-stage bilateral THRs with cement during the 2-year period. Since there were insufficient numbers of patients who underwent two-stage bilateral THRs during this period, an assumption was made that each unilateral procedure was representative of one side of a two-stage THR. Over a 2-year period, 40 patients (80 hips) underwent primary bilateral THR with cement (group 1). Forty patients, matched in terms of diagnosis, age, gender, medical co-morbidities and month of surgery, were selected from patients who underwent
primary unilateral THR with cement (group 2).

**Study design**
The study was a single-centre, retrospective observational study. The patients were followed-up for the length of their hospital stay. No patients were lost to follow-up. There was no blinding for the assessment of outcomes.

**Analysis of effectiveness**
The clinical study was analysed using treatment completers only. The primary health outcomes used in the analysis of effectiveness were: length of operation; estimated blood loss per THR; length of hospital stay; and peri-operative complications. The patients in group 2 matched those in group 1 with respect to diagnosis, age, gender, medical co-morbidities, and month of surgery.

**Effectiveness results**
The mean operating time was 58 minutes (range: 50 - 77) for group 1 and 53 minutes (range: 45 - 74) for group 2, (no statistical difference).

The mean estimated blood loss per THR was 535 mL (range: 260 - 850) for group 1 and 550 mL (range: 260 - 950) in group 2, (no statistical difference).

The mean length of hospital stay was 10 days (range: 5 - 21) for group 1 and 8 days (range: 5 - 15) for group 2, (p<0.05).

**Clinical conclusions**
The authors concluded that there was no difference between the one-stage and two-stage bilateral THRs in terms of operative time, estimated blood loss or peri-operative complications. There was a significant decrease in the total length of hospital stay for the one-stage group.

**Measure of benefits used in the economic analysis**
The authors reported that the clinical effectiveness results were equivalent. Hence, they reported a cost-minimisation analysis.

**Direct costs**
The quantities and unit costs, relating to the length of hospital stay, were analysed separately. The direct costs to the hospital were included in the analysis. However, the type of direct costs included in the analysis was not reported. The authors reported that the total costs were based on the total charge for each THR, as submitted by the hospital business office to the relevant insurance company. The quantities and the costs were estimated from actual data. The time-horizon for the study was the length of hospital stay. Discounting was irrelevant due to the short timeframe of the analysis.

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

**Indirect Costs**
The indirect costs were not reported as they were not appropriate to the perspective of this study.
US dollars ($). No currency conversion rates were reported.

Sensitivity analysis
No sensitivity analysis was carried out.

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

Cost results
The mean total hospital charge was $26,645 (range: 21,112 - 38,639) for each case of one-stage bilateral THR (group 1) and $34,964 for each case of two-stage bilateral THR (group 2).

Synthesis of costs and benefits
The costs and benefits were not combined. The authors reported the incremental cost of two-stage versus one-stage THR, which was $8,319.

Authors' conclusions
The authors concluded that one-stage bilateral total hip replacement (THR) surgery was more cost-effective than two-stage bilateral procedures. The authors reported that the results also demonstrated the safety of one-stage procedures during the peri-operative period.

CRD COMMENTARY - Selection of comparators
One-stage THRs were compared with two-stage bilateral THRs. These were considered explicitly to be the intervention and the comparator, respectively. It was clear why these two comparators were chosen, in that they represented current treatment options for the management of osteoarthritis in the authors' setting. You should decide if these are widely used health technologies in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on data from an observational study, which was only partially appropriate for the study question. The use of an observational study, rather than a randomised controlled trial, did not allow for the potential bias associated with selecting the patients. One surgeon conducted all the THRs and selected patients himself for a one-stage procedure, which could have biased the results in favour of the one-stage procedure.

The study sample seems to have been appropriate to the study question. However, it was not possible to assess whether it was representative of the study population because key patient characteristics, such as length of diagnosis and patient weight, were not reported. Further, the study did not report power calculations to determine the sample size. The lack of statistical difference may have been due to an inadequate sample size, rather than equivalence between the two groups.

Validity of estimate of measure of benefit
The authors assumed that the analysis of benefits was based upon the therapeutic equivalence of the two treatment alternatives. The authors, therefore, only included the costs in the economic analysis. However, it was unclear whether the two treatment options were, in fact, therapeutically equivalent. The study only assessed short-term (inpatient) measures of effectiveness. It did not assess the impact of a one-stage procedure, rather than a two-stage procedure, on long-term post-discharge outcomes such as improvement in mobility and reduction in pain.

Validity of estimate of costs
The resources associated with hospital length of stay were analysed separately from the total cost associated with hospital length of stay. The authors did not describe the categories of costs included in the analysis. It was therefore not possible to comment on the validity of the cost estimates, or whether all the cost categories relevant to the study perspective were included in the analysis. The analysis used hospital charges taken from the authors’ setting, which affects the generalisability of the results. A sensitivity analysis of the quantities and costs was not reported, thus further limiting the generalisability of the study's findings. The costs were not discounted as they were incurred over a short timeframe (less than one year).

Other issues
The authors made appropriate comparisons of their findings with those from other studies. However, they did not address the issue of generalisability to other settings due to the use of the hospital charges, rather than the prices, and the omission of a sensitivity analysis. The authors appear to have presented their results selectively. Not all of the relevant characteristics of the study sample were reported. In particular, the weight and length of diagnosis of osteoarthritis, and the severity of symptoms such as pain, were not reported. It is therefore unclear whether it is possible to generalise the results of this study to the wider population of patients with osteoarthritis.

The authors reported that one limitation of the study design was the assumption that data for the two-stage bilateral procedures could be estimated by doubling the data for a unilateral procedure. However, they believed this assumption to be acceptable because both patient groups were identical in terms of the clinical parameters and the prosthesis selection.

Implications of the study
The authors reported that one-stage bilateral THR was more cost-effective than two-stage bilateral procedures. They went on to state that they continue to perform one-stage bilateral THRs in selected patients, although they did not provide the characteristics of these patients.

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