Cost effectiveness of minimally invasive total hip arthroplasty

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.

CRD summary
The objective was to examine the cost-effectiveness of two minimally invasive techniques for total hip arthroplasty, which were the mini-incision technique and the Minimally Invasive Solutions two-incision hip procedure. These were compared with conventional surgery. The authors concluded that the minimally invasive techniques were more effective and less expensive than the conventional approach and that the two-incision strategy was the most efficient option. The methodology had some limitations, which might affect the validity of the authors’ conclusions.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to examine the cost-effectiveness of minimally invasive techniques for total hip arthroplasty (THA) compared with a conventional technique.

Interventions
The two minimally invasive surgical procedures were the mini-incision technique and the Minimally Invasive Solutions, two-incision technique. The comparator was the conventional surgical procedure.

Location/setting
USA/hospital.

Methods
Analytical approach:
This economic evaluation was based on a single study with a six-week time horizon. The authors did not state explicitly which perspective was adopted in the economic analysis.

Effectiveness data:
The clinical evidence came from a prospective cohort study, with a follow-up of six weeks, carried out in 10 hospitals (academic and medical centres across the USA). This study enrolled 591 patients with 235 in the two-incision group, 325 in the mini-incision group, and 31 in the conventional group. The outcomes for the conventional approach were derived from a similar sample of 171 patients in a published study (the Investigational Device Exemption study). There were differences at baseline between the study groups in terms of their demographic characteristics and health status (patients in the conventional group were older and less healthy). The primary clinical endpoint was the change in health status.

Monetary benefit and utility valuations:
The utility valuations were derived from the patients in the clinical study, using the Medical Outcomes Study Short Form (SF-36) health survey. Other measures of quality of life were also used.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure. Given the relatively short time horizon, QALYs were also presented as quality-adjusted life-days (QALDs).

Cost data:
The cost categories were those related to the surgical procedure and the subsequent hospital acute stay, the post-acute
rehabilitation period, and wages foregone by employed THA patients. The specific approach used to calculate the indirect costs was described. Hospital costs were taken from bills from the hospitals that were included in the clinical study. The provider costs (surgeon and rehabilitation) were based mainly on Medicare reimbursement rates. National cost-to-charge ratios were applied to convert these charges into true costs. All costs were in US dollars ($) and the price year was not reported.

Analysis of uncertainty:
A deterministic univariate sensitivity analysis was carried out by varying the clinical and economic assumptions. The alternative ranges of values appear to have been based on authors' opinions.

Results
The total costs were $16,085 with the two-incision strategy, $16,615 with the mini-incision strategy, and $21,705 with the conventional strategy.

Substantial differences were found in hospital stay, rehabilitation, and indirect costs between the two minimally-invasive techniques and the conventional surgery.

At six weeks, the expected QALYs were 0.053 (19.35 QALDs) with the two-incision strategy, 0.039 (14.24 QALDs) with the mini-incision strategy, and 0.016 (5.84 QALDs) with the conventional strategy. At six months, no statistically significant differences were observed in patient quality of life measures.

The superior profile of the two-incision strategy was maintained in the alternative scenarios considered in the sensitivity analyses.

Authors' conclusions
The authors concluded that minimally invasive techniques for THA were more effective and less expensive than the conventional surgical approach and that the two-incision strategy was the most efficient option.

CRD commentary
Interventions:
The selection of the surgical procedures appears to have been appropriate in that the two innovative approaches were compared with the conventional strategy.

Effectiveness/benefits:
The use of a cohort study raises some issues related to the non-randomised allocation of patients to study groups; patient and surgeon preferences determined the selection of the surgical technique. At baseline, the study groups were significantly different in their demographic characteristics, suggesting strong surgeon-patient selection biases and preferences. This issue may have affected the validity of the comparison. The authors stated that the study hospitals were representative of a variety of medical centres in the USA. The sample size for each treatment group was not balanced and an external control group was required. The selection of the time horizon was appropriate as it corresponded with the typical period required for recovery after THA. QALYs are a generalisable benefit measure and allow cross-disease comparisons. A statistical approach was applied to minimise the potential impact of selection bias in the derivation of utility valuations. However, the authors pointed out the limitations of the tool used to derive the valuation of health status.

Costs:
The study perspective was not explicitly reported, but a wide variety of costs were included. The main cost categories appear to suggest the viewpoint of society. The sources of costs were reported for each item, but the unit costs, resource quantities, and price year were not, which might reduce the transparency of the economic analysis. The cost estimates were treated deterministically, although some were varied in the sensitivity analysis. The authors stated that the resource use was valued retrospectively, which further limits the study validity.

Analysis and results:
A synthesis of the costs and benefits was not required, given the dominance of the two-incision strategy. The findings
were clearly presented. The sensitivity analysis was restricted to individual changes in the key assumptions on costs and outcomes and a more comprehensive approach would have been useful, but the findings were robust. The authors did not address the issue of whether these findings were generalisable to other settings. Some potential limitations of the analysis were pointed out, especially with respect to the compatibility of bills with national average Medicare reimbursement. Surgeon preferences and ethical issues increased the potential impact of patient selection bias.

Concluding remarks:
The methodology had some limitations, which might affect the validity of the authors’ conclusions.

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