Cost effectiveness analysis of hemiarthroplasty and total shoulder arthroplasty
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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.

CRD summary
This study assessed the cost-effectiveness of total shoulder arthroplasty compared with hemiarthroplasty for patients with glenohumeral osteoarthritis, who were aged 64 years or older. The authors concluded that total shoulder arthroplasty was the best option as it had greater benefits for the patient and lower costs for the payer. The methods were generally valid. The data sources were not reported in detail, but the authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis, cost-benefit analysis

Study objective
This study assessed the cost-effectiveness of total shoulder arthroplasty compared with hemiarthroplasty in patients with glenohumeral osteoarthritis who were aged 64 years or older.

Interventions
The two surgical procedures were total shoulder arthroplasty or hemiarthroplasty. The former consisted of humeral head replacement, using a cemented component, plus glenoid resurfacing. The latter consisted of humeral head replacement only, using a stemmed component.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a Markov decision model, with a lifetime horizon. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical data were derived from the literature. Most of them were from systematic reviews, meta-analyses, or clinical trials. Expert opinion was used where no estimates were found. The rate of revision was the key clinical endpoint and these data were from a systematic review.

Monetary benefit and utility valuations:
The utility values were from published studies that used the Short Form (SF-36) Health Survey. There was no data for total shoulder arthroplasty, so the utility values for total hip arthroplasty were used. Two scenarios were considered: one assumed equal utilities for the two surgical procedures and the other assumed a 5% higher utility for total shoulder arthroplasty.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and were discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs of primary total shoulder arthroplasty or hemiarthroplasty, and subsequent surgical procedures. These costs were estimated, using Medicare reimbursement rates, for the two surgical procedures (Diagnosis Related Group data) and Current Procedural Terminology for the professional fees. All costs were in US dollars ($) and the price year was 2008. A 3% annual discount rate was applied.
Analysis of uncertainty:
Deterministic one- and multi-way sensitivity analyses were undertaken, for the model inputs, using plausible ranges of values. A Monte Carlo simulation was carried out to determine confidence intervals for the model outcomes.

Results
In the scenario with equal utilities for the two surgical procedures, the projected QALYs were 12.19 with total arthroplasty and 11.43 with hemiarthroplasty, while in the scenario with a 5% higher utility for total arthroplasty, the QALYs were 11.86 with total and 11.70 with hemiarthroplasty. The expected costs were $11,675 with total and $13,645 with hemiarthroplasty. Total shoulder arthroplasty was dominant, as it was more effective and less expensive, with either utility assumption. The average cost per QALY was $957 for total arthroplasty and $1,194 for hemiarthroplasty, with equal utilities.

The most influential inputs were the utility values for primary total shoulder arthroplasty and hemiarthroplasty, the probability of revision total arthroplasty, and the initial cost of total arthroplasty, but total arthroplasty remained the most cost-effective strategy in most scenarios, at a willingness-to-pay threshold of $50,000 per QALY.

Authors' conclusions
The authors concluded that total shoulder arthroplasty was the best treatment, as it had greater benefits for the patient and lower costs for the payer, compared with hemiarthroplasty.

CRD commentary
Interventions:
The selection of the comparators was appropriate as the two available surgical procedures for glenohumeral osteoarthritis were considered.

Effectiveness/benefits:
It was unclear whether a systematic review of the literature was undertaken to identify the relevant sources of data. The methods and other aspects of the interventions and patient samples, in the source studies, were not reported, but the authors stated that the most influential clinical inputs (the revision rate and the utility values) were from systematic reviews of the literature or clinical trials. This should have ensured a high internal validity and the inclusion of the most relevant data. The key inputs of the model were tested in the sensitivity analyses. The authors provided evidence to support the use of hip data and the SF-36 for the assessment of glenohumeral osteoarthritis patients' quality of life. QALYs were a relevant benefit measure, given the impact of the disease on both survival and quality of life.

Costs:
The authors stated that a societal perspective was adopted, but they only included the direct medical costs. Productivity losses were probably excluded due to the age of the patients, but non-medical resources should have been included for the broad perspective. The costs were presented as category totals and were not broken down into individual items, which reduces the transparency of the analysis, but is common when using reimbursement rates for hospital services from the US health care system. The price year and discounting were appropriately reported.

Analysis and results:
The results were clearly reported and an incremental approach was used to identify the best procedure. Ratios were not calculated in the base case analysis, because total shoulder arthroplasty was dominant. The average cost-utility ratios were reported. The uncertainty was investigated in a deterministic analysis that considered simultaneous variations in the model inputs. The results of the analysis were specific to elderly patients and might not be generalisable to a younger population. Some potential weaknesses were stated by the authors, including the use of utility values for total hip arthroplasty rather than total shoulder arthroplasty, and the exclusion of patient-specific factors that might have affected the surgical outcomes, such as glenoid morphology.

Concluding remarks:
Generally, the methods were valid. The data sources were not reported in detail, but the authors’ conclusions appear to be robust.
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