Rotator cuff repair: an analysis of utility scores and cost-effectiveness

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
The study investigated the use of surgical cuff repair compared with no cuff repair.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients with rotator cuff tears who underwent repair by the principal investigator. The inclusion criteria were rotator cuff tear verified on arthroscopic evaluation, at least 12 months of failed nonsurgical treatment, age between 40 and 80 years, and ability to communicate effectively with investigators. The exclusion criteria were concurrent humeral arthroplasty and primary glenohumeral osteoarthritis, rheumatoid arthritis, fracture or osteonecrosis.

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

Dates to which data relate
The dates over which patients were recruited into the study were not reported. The price year was not reported.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample that provided the effectiveness data.

Study sample
No sample size would appear to have been determined in the planning phase of the study in order to assure a certain power. The authors enrolled eligible patients undergoing surgical repair by the principal investigator. They did not report how many patients were excluded from the study or how many eligible patients refused to participate. A total of 87 patients (54% male) were enrolled into the study.

Study design
The study was a within-group comparison that was undertaken in a single centre. The principal investigator of the study performed all surgical operations. The patients were followed up for 1 year. The authors did not report if there was any loss to follow-up.
Analysis of effectiveness
The primary outcome used was quality of life, which was measured using Health Utilities Index (HUI), EuroQol-5D (EQ-5D) and Short-Form 36 (SF-36) scores. As the authors did not report the number of patients remaining at the end of follow-up, it was unclear if all patients included in the study were accounted for in the analysis.

Effectiveness results
At baseline (i.e. before surgery), the overall HUI score averaged 0.803 (standard deviation, SD=0.132), compared with 0.851 (SD=0.126) at 1 year after surgery, (p=0.025). Postoperatively, two HUI domains improved significantly. These were self-care and pain.

At baseline, the overall EQ-5D score averaged 0.563 (SD=0.282), compared with 0.763 (SD=0.249) at 1 year after surgery, (p<0.001). Furthermore, all 5 domains of the EQ-5D were found to have improved significantly.

The results from the SF-36 showed that patients improved significantly in role limitations due to physical function, (p<0.0001), physical function, (p<0.0001), social function, (p=0.003) and pain, (p<0.0001) 1 year after surgery.

Clinical conclusions
The study found significant improvements in quality of life 1 year after surgical cuff repair.

Modelling
Outcome results were extrapolated beyond the study period (i.e. 1 year) using the estimated lifespan for each patient.

Measure of benefits used in the economic analysis
The measure of benefits used was the QALYs. The utility estimates were derived directly from the effectiveness study (see above) using the HUI and EQ-5D. The authors did not report the formula used to convert responses from the EQ-5D and HUI into utilities. These utility estimates were then combined with life-expectancy to form QALYs. As benefits could be generated over the expected lifetime of the patient, discounting was relevant and was appropriately performed at an annual rate of 3%.

Direct costs
The direct costs to the healthcare provider were included in the analysis. These included hospital costs (e.g. operating room, anaesthesiology, recovery room, pathology and hospital room) and physician payments (e.g. surgeons, radiologists and anaesthesiologists). Inpatient charges, procedure charges, and physician fees and payments were collected from patient medical records, hospital bills and administrative databases. Charges were converted into costs using a ratio of cost-to-charge methodology. Discounting was not relevant as the costs were incurred during 1 year. However, the authors discounted 1-year costs at an annual rate of 3%. The price year was not reported. The study reported the average costs.

Statistical analysis of costs
The authors reported mean values together with their SDs.

Indirect Costs
The authors reported that productivity costs were not included in the analysis as these were captured in the estimation of QALYs.

Currency
US dollars ($).
Sensitivity analysis
The authors performed a series of one-way and multi-way sensitivity analyses. In the one-way sensitivity analyses, costs, QALYs and discount rates were varied. The costs and QALYs were varied by the upper and lower bounds of the 95% confidence intervals (CIs), while discount rates were varied between 0 and 5%.

Estimated benefits used in the economic analysis
Over the patient's estimated life span, the mean QALYs gained from surgery were 0.81 (SD=1.93) when using the HUI and 3.43 (SD=4.16) when using the EuroQol.

Cost results
The total hospital costs incurred by the cuff repair surgery were $10,605.20 (SD=2,566.23) per patient.

Synthesis of costs and benefits
The costs and benefits were combined using an incremental cost-utility ratio (i.e. the additional cost per QALY gained).

The incremental cost-utility ratio was $13,092.84 per QALY gained by use of HUI scores, and $3,091.90 per QALY gained by use of EuroQol scores.

The results of the sensitivity analyses showed that varying costs and QALYs by their upper and lower 95% CI bands had a small impact on the incremental cost-utility ratios.

Authors' conclusions
The cost-effectiveness of rotator cuff repair compared favourably with other common interventions in health care.

CRD COMMENTARY - Selection of comparators
Although no explicit justification was given for using a do-nothing approach (i.e. no cuff repair surgery) as comparator, it would appear to be current practice in the authors' settings. You should decide if the comparator used represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a within-group analysis, which is associated with limitations such as inclusion bias and the potential for external factors to influence the results. The study sample appears to have been representative of the study population. The authors reported very few details of the methodology used. For example, they did not report how many patients were excluded or refused to participate, nor did they report the loss to follow-up. Consequently, the internal and external validity of the study is questionable. Appropriate statistical analyses were undertaken to identify whether differences were statistically significant.

Validity of estimate of measure of benefit
The estimation of health benefit was derived from the effectiveness study and then extrapolated over the remaining life expectancy of the patient. Since the benefits could be incurred over the lifetime of the patient, discounting was relevant and was appropriately performed. Utility values were measured using the HUI and EuroQol. The authors did not report the valuation methods used to transform responses into utilities. Furthermore, for the EuroQol, it was not clear whether the EQ-5D responses or the rating scale were used to obtain utilities.

Validity of estimate of costs
The authors reported that the study had been conducted from a societal perspective. However, the only costs included in the analysis were those to the health care provider; other relevant health care costs, such as primary care costs, and productivity losses were not included. Although the authors reported that the impact of the intervention on productivity losses would be captured in the utility values, both UK and USA guidelines recommend their inclusion if a societal
perspective is adopted. The exclusion of productivity costs would appear to have biased the results against surgical cuff repair, whereas the omission of other health care costs would have biased the results in favour of surgery.

The costs were derived from the authors’ settings. Charges were at first used to proxy prices. However, these were then converted into costs using appropriate cost-to-charge ratios. Although discounting was not relevant as the costs were incurred during 1 year, the authors did discount the costs. Neither the price year nor the years over which resource use was incurred were reported.

Other issues
The authors reported that few data were available on the utility and costs of cuff repair. The issue of generalisability to other settings was partly addressed in the sensitivity analyses. The authors do not appear to have reported their results selectively, although they should have reported the loss to follow-up and number of patients excluded. The authors’ conclusions reflected the scope of their analysis, although the results should be treated with some caution given the problems concerning the internal and external validity of the effectiveness study.

The authors acknowledged a number of further limitations to their study. First, the costs were only evaluated for 1 year, whereas benefits were for the entire lifetime of the patient, which could generate biases as this might ignore downstream costs beyond 1 year. Second, the authors assumed that utility data collected at 1 year persisted throughout the patients’ lifetime. Finally, as a single surgeon performed the operation there was a degree of homogeneity to the results, which might not represent the average utilities gained or costs accrued for other surgeons.

Implications of the study
The authors recommend the development of a stochastic mathematical model of intervention costs and benefits that would allow a more continuous representation of long-term functional outcomes, mortality, revision surgeries and costs.

Source of funding
Supported by a grant from the Orthopaedic Research and Education Foundation.

Bibliographic details

PubMedID
17399623

DOI
10.1016/j.jse.2006.06.013

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Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Cost-Benefit Analysis; Female; Humans; Male; Middle Aged; Orthopedic Procedures /economics; Prospective Studies; Rotator Cuff /injuries /surgery

AccessionNumber
22007000698

Date bibliographic record published
30/04/2008

Date abstract record published
30/04/2008