The economics of minimally invasive total knee surgery

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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
The study compared minimally invasive total knee arthroplasty (MIS-TKA), using either MIS Mini-Incision or MIS Quadriceps-Sparing techniques, with traditional total knee arthroplasty (TKA).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients undergoing TKA. No further inclusion or exclusion criteria were reported.

Setting
The study setting was secondary care. The study was undertaken in the USA.

Dates to which data relate
The effectiveness data appear to have been derived from patients undergoing surgery between 2002 and 2005. The price year was 2002.

Source of effectiveness data
The effectiveness data were derived from a single study, supplemented with authors' assumptions.

Link between effectiveness and cost data
The costing was undertaken prospectively on a sub-group of patients included in the effectiveness analysis.

Study sample
No sample size appears to have been determined in the planning phase of the study. In addition, no retrospective power calculations were reported. The authors reported that a group of MIS-TKA patients was compared with a group of 50 traditional TKA patients, but it was unclear how many patients were in the MIS-TKA group. The authors then reported that all patients (n=159) were cohort matched for age, gender and body mass index. No age or gender characteristics were reported for any of the two groups. No exclusions were reported.

Study design
This was a prospective cohort study that was undertaken in what appears to have been centre. The patients seem to have
been followed up until they were discharged from hospital. Neither blinding of the assessment nor the loss to follow-up was reported.

Analysis of effectiveness
It was unclear whether all patients included in the study were accounted for in the analysis. The primary outcomes used were length of stay, blood transfusion requirements, distance walked at postoperative day 3, and range of motion in the knee. The authors reported that the groups were matched in terms of their age, gender and body mass index.

Effectiveness results
MIS-TKA patients had significantly shorter length of stay than traditional TKA patients (3.4 versus 5.9 days; p<0.0001).

MIS-TKA patients had lower blood transfusion requirements than traditional TKA patients (4% versus 34%; p<0.0001).

MIS-TKA patients walked three times further than traditional TKA patients at postoperative day 3 (176 versus 58 feet; p<0.001).

MIS-TKA patients had significantly better range of motion than traditional TKA patients on postoperative day 1 (68.6 versus 48.6 degrees; p<0.001). At postoperative day 3, the range of motion was 82.3 degrees for MIS-TKA patients and 73 degrees for traditional TKA patients. However, the authors did not report if such differences were statistically significant.

Clinical conclusions
Minimally invasive surgery of the knee was found to be associated with better outcomes than traditional knee surgery.

Methods used to derive estimates of effectiveness
The authors made some assumptions to derive effectiveness outcomes

Estimates of effectiveness and key assumptions
A performance rate of 10 to 20% was assumed for TKA using MIS techniques.

A high reoperation rate of 10% was assumed for TKA using MIS techniques.

Measure of benefits used in the economic analysis
The authors did not derive a measure of health benefit. The analysis was therefore categorised as a cost-consequences study.

Direct costs
The direct costs included in the analysis were those to the health care provider and health care system. To calculate potential savings to the health care system, the authors used Medicare per diem costs and national procedure frequency for 2002. The authors reported that they did not consider post discharge reductions in medication costs or rehabilitation costs. The costs and the quantities were not analysed separately. To compare hospital charges, the authors compared 34 patients undergoing traditional TKAs with 34 undergoing MIS-TKAs. It was unclear which costs were included in these analyses. Discounting was not relevant, as the costs were incurred during a short time, and was therefore not performed. The authors reported the total savings. The average and total costs were reported for the fiscal year 2005. The price year was 2002.
Statistical analysis of costs
The costs were treated as point estimates (i.e. the data were deterministic).

Indirect Costs
The indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
One-way sensitivity analyses were undertaken by varying the performance and reoperation rates of MIS-TKA.

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

Cost results
The total hospital costs for MIS-TKA in 2005 were $13,528.

Assuming a 10% performance rate, the use of MIS-TKA was estimated to generate cost-savings of $185 million per year on Medicare patients alone. At a 20% rate, savings were estimated to rise to approximately $370 million.
Assuming a high reoperation rate of 10%, and an adoption rate of 10%, annual savings of $100 million to $200 million would be realised when adopting MIS-TKA.

When assessing hospital charges, the authors found that, on average, MIS-TKA procedures were $8,600 less than traditional TKA, a charge reduction of 26%.

Synthesis of costs and benefits
The costs and benefits were not combined.

Authors' conclusions
The study concluded that minimally invasive total knee arthroplasty (MIS-TKA) reduced postoperative morbidity, and generated cost-savings to the health care provider and health care system.

CRD COMMENTARY - Selection of comparators
The use of traditional TKA as the comparator was justified on the grounds that it represented current practice in the authors' setting. 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 prospective cohort study. However, the authors provided very few details of the methods used and the characteristics of the patient groups to be able to judge the internal validity of the study. For example, it was unclear how patients were recruited, how many patients were in each group, and for how long patients were followed up. Appropriate statistical analyses were used to test whether differences in outcomes between the patient groups were statistically significant.

Validity of estimate of measure of benefit
The authors did not derive a measure of health benefit. The analysis was therefore categorised as a cost-consequences study.

**Validity of estimate of costs**
The authors provided no information on the costs included in their analysis. Consequently, it was not possible to determine if all the cost categories and costs were included in the analysis. This lack of information will also hamper the generalisability of the authors’ results. The costs and the quantities were not reported separately, thus the analysis could not be easily reworked for other settings. A very limited sensitivity analysis of the costs was performed to determine the savings generated to the health care system when adopting MIS-TKA. Since all the costs were incurred during a short time, discounting was not relevant. The price year was reported, which will aid any future reflation exercises.

**Other issues**
The authors reported that other studies also showed that MIS-TKA generated shorter lengths of stay, reduced postoperative morbidity, and resulted in higher patient satisfaction. The issue of generalisability to other settings was not addressed. The lack of detailed information about the study made it difficult to assess whether the authors presented their results selectively. The authors reported no limitations to their study.

**Implications of the study**
The authors reported that reimbursement schedules should be modified so as to reward surgeons, rather than penalise them, for their enterprise in adopting MIS procedures.

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**Bibliographic details**

**Other publications of related interest**


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Subject indexing assigned by CRD

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