Cost-effectiveness analysis of custom total knee cutting blocks
Slover JD, Rubash HE, Malchau H, Bosco JA

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 investigated the cost-effectiveness of custom cutting block technology, compared with traditional total knee arthroplasty, for adults in the USA. The authors concluded that only with a significant reduction in the revision rate would custom cutting blocks be considered cost-effective; a shorter surgery time could make them cost-effective. The authors' conclusions appear to have been appropriate, given the lack of clinical evidence for the effectiveness of custom blocks.

Type of economic evaluation
Cost-utility analysis

Study objective
The aim was to examine the cost-effectiveness of custom total knee cutting blocks, for adults requiring total knee arthroplasty in the USA.

Interventions
The study assessed the cost-effectiveness of custom total knee cutting blocks, compared with traditional total knee arthroplasty. Custom cutting blocks used advanced imaging techniques to improve alignment and to avoid revisions due to misalignment of the implant components arising from the surgical technique.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A Markov decision model was used to synthesise the evidence from a key published study and patient-level data from a Medicare population from 1997 to 2004. The authors stated that a societal perspective was taken and the time horizon was 20 years.

Effectiveness data:
The clinical outcomes included arthroplasty implant failure and success rates. For the success of total knee arthroplasty the authors used data from administrative databases (Medicare; 5% sample of patients aged 65 years or older) and arthroplasty registries. The effectiveness of custom cutting blocks was assumed to be zero, in the main analysis, as there was no evidence to determine its effectiveness. This was then varied in the sensitivity analysis to evaluate the effectiveness required to make them cost-effective.

Monetary benefit and utility valuations:
The utilities for before and after surgery were abstracted from the Swedish Hip Arthroplasty Register and the Tufts Cost-Effectiveness Registry.

Measure of benefit:
The measure of benefit was quality-adjusted life-years (QALYs), which were discounted at 3% per year.

Cost data:
The direct medical costs for total knee arthroplasty, included the primary surgical and revision procedures, based on the hospital billing costs for Diagnosis-Related Groups #544 and #545. The costs for custom cutting blocks included those
for total knee arthroplasty plus the imaging resources and the cost of manufacturing the custom blocks, but not the implant itself. The costs were presented in US $ for 2007 and were discounted at 3% per year.

Analysis of uncertainty:
Analyses were performed by varying the total cost of the custom cutting block technology and the revision rates in a two-way sensitivity analysis. A graph of the results was presented.

Results
Over 20 years, the mean cost was estimated to be $21,430 for the custom cutting block, compared with $17,450 for total knee arthroplasty. For custom cutting blocks, the estimated imaging costs were $1,000 and manufacturing costs were $1,500.

The QALYs were 4.6 for both custom cutting blocks and total knee arthroplasty. The total knee arthroplasty survival or success rates ranged from 85.1% to 99.3% and the annual failure rates ranged from 0.4% to 1.0%, over the 20 years. The success rates were assumed to be equal for the two options.

The custom cutting block required a revision rate reduction of 50% and a maximum mean cost of $4,600 for it to be cost saving compared with total knee arthroplasty.

Authors' conclusions
The authors concluded that only with a significant reduction in the revision rate would custom cutting blocks be considered cost-effective. There was an absence of data on the duration of surgery, which could be shorter with the custom cutting blocks and this could offset the costs of the technology.

CRD commentary
Interventions:
The two strategies were sufficiently described. Custom cutting blocks might be an appropriate alternative to total knee arthroplasty in other settings, taking into consideration its safety profile, manufacturing needs and approval for use.

Effectiveness/benefits:
In the main analysis it was assumed that there was no survival advantage with custom blocks as there was no evidence for it. The focus of the paper was to evaluate the cost-effectiveness of custom blocks assuming different effectiveness estimates. No details of the measurement or valuation methods for the utilities were provided.

Costs:
The analysis included the costs from a hospital perspective rather than societal as the authors stated. The unit costs were presented in the report and were based on nationally representative Diagnosis-Related Group codes. The costs for the other resources for custom cutting blocks were from the authors' institution and it was unclear how these might have differed in comparison with other hospitals. The costs of surgical training and education, and follow-up consultations were not included and it is uncertain what additional cost burden these could have and their impact on the cost-effectiveness estimates.

Analysis and results:
The authors highlighted some limitations to their study, including the reliance on a limited evidence base for the parameters for the model. The analyses were basic and the sensitivity analysis results were not fully presented. The analysis was from a hospital perspective rather than societal.

Concluding remarks:
The authors’ conclusions appear to have been appropriate, given the lack of clinical evidence for the effectiveness of custom blocks.

Funding
No external funding received.
Bibliographic details

PubMedID
21676584

DOI
10.1016/j.arth.2011.04.023

Original Paper URL
http://www.arthroplastyjournal.org/article/S0883-5403(11)00207-5/abstract

Indexing Status
Subject indexing assigned by NLM

MeSH
Aged; Aged, 80 and over; Arthroplasty, Replacement, Knee /economics /instrumentation; Cost-Benefit Analysis; Humans; Knee Joint /surgery; Knee Prosthesis; Markov Chains; Reoperation; Retrospective Studies

AccessionNumber
22012001595

Date bibliographic record published
16/03/2012

Date abstract record published
03/12/2012