Cost-effectiveness of aortic valve replacement in the elderly: an introductory study

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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
The objective was to use a long-term database to produce an introductory report on the cost-effectiveness of aortic valve replacement (AVR) compared with a non-surgical strategy. The authors concluded that AVR was cost-effective, even for the very elderly. The study had some methodological limitations which might affect the validity of the authors’ conclusions. They acknowledged that this was a preliminary analysis and further investigations should gather detailed data and refine their methodology to produce more definitive results.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to undertake an introductory report, on the cost-effectiveness of aortic valve replacement (AVR), using a large database with long-term follow-up data.

Interventions
AVR was compared with a strategy of maintaining patients with heart valve disease without surgery.

Location/setting
USA/hospital.

Methods
Analytical approach:
This economic evaluation was based on a statistical simulation model, with a lifetime horizon. The authors did not explicitly state the perspective adopted.

Effectiveness data:
The clinical data on AVR were derived from a database of 4,617 patients aged 20 years or older who underwent AVR at three hospitals in Portland (Oregon) from 1961 to 2003. All patients were followed-up over their lifetime using a combination of annual mailed questionnaires and telephone interviews. The data for those patients who were still alive at the time of this study were considered to be censored and the expected survival was simulated using a Gompertz parametric regression model. The survival of patients without surgery for heart valve disease was derived from: a systematic review of the literature in English in the MEDLINE database, the American College of Cardiology and the American Heart Association guidelines, and a published study. The inclusion criteria and details of the statistical tests used to derive the survival data were reported. The key clinical endpoint was survival for both groups of patients.

Monetary benefit and utility valuations:
The utility valuations were estimated by mapping quality of life scores to New York Heart Association (NYHA) classes derived from the hospital database.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure.

Cost data:
The economic analysis assumed that the lifetime cost of maintaining patients with heart valve disease without surgery was zero. There were three major categories of costs associated with AVR: primary surgery, ongoing maintenance.
(physician visits, echocardiograms, and anticoagulation therapy), and treatment of valve-related complications (thromboembolism, bleeding, and valve implant removal and re-implantation). The cost of surgery was derived from the authors’ institution and other costs were obtained from the published literature, but the details were not reported. All costs were in US dollars ($) and the price year was 2005.

Analysis of uncertainty:
Not carried out.

Results
The mean survival years were estimated to be 12.4 with AVR and 2.2 without surgery. The QALYs were 9.4 with AVR and 1.2 without surgery. The total QALYs in the whole sample of patients in the database were 39,505 with AVR and they were 6,159 without surgery.

The expected costs in the whole sample were $451 million with AVR and $0 without surgery. Thus, the incremental cost per QALY gained with AVR over no surgery was $13,528 ($19,826 for patients aged over 80 years and $27,182 for those aged over 90 years).

Authors’ conclusions
The authors concluded that AVR was a cost-effective treatment, even for the very elderly. They recommended that further investigations gather detailed data and refine their methodology to provide more definitive results.

CRD commentary
Interventions:
The selection of the interventions was appropriate as the available strategy for patients with heart valve disease was no surgery.

Effectiveness/benefits:
The analysis was on data derived from a long-term database, which held administrative data on patients who had undergone AVR. The large sample of patients and the long-term follow-up should have ensured the validity of these estimates, but the use of an administrative database is associated with limited internal validity, especially given the long time frame, which mixed different eras of heart surgery. The authors acknowledged that the clinical evidence for the natural history of heart valve disease was derived from old studies with relatively small sample sizes. Medical treatment changes over time and the life expectancy of patients with severe heart valve disease may be greater now than that used in this analysis. These issues may have affected the validity of the clinical comparison. QALYs are a valid benefit measure and appropriate for this disease. The authors noted that several other tools were available for the assessment of quality of life, but these were not appropriate for their historical cohort. NYHA functional class was used as a proxy for quality of life and these two measures were demonstrated in the literature to have some correlation.

Costs:
The authors did not explicitly report the economic perspective adopted, but the categories of costs suggest a payer’s perspective. These costs were presented as macro-categories and were not broken down into individual items. Details on the sources used were not clearly reported. The authors acknowledged that cost estimates were not precise and that some approximation was required for certain categories. Discounting would have been appropriate, but it was not mentioned in the paper. In general, the economic analysis had some limitations.

Analysis and results:
The costs and benefits were clearly reported and synthesised, but the issue of uncertainty was not investigated. The key assumption that the costs for non-surgical patients were zero was biased against the AVR strategy. The authors noted some potential drawbacks of their study, which are reported in the relevant sections above.

Concluding remarks:
The study has some methodological limitations which might affect the validity of the authors’ conclusions.
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