Synthetic vascular hemodialysis access versus native arteriovenous fistula: a cost-utility analysis

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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 study objective was to determine the cost-effectiveness of two vascular access strategies among incident dialysis patients. The authors concluded that arteriovenous fistulas were cost-effective as long as the probability of maturation was set at 36% or greater. Overall quality of the study methodology was adequate and the results were reported sufficiently, but some details of the effectiveness data were not fully reported and this made it difficult to assess the appropriateness of the authors’ conclusions.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective of the study was to determine the cost-effectiveness of two different vascular access strategies among incident dialysis patients.

Interventions
The study compared two potential vascular access management strategies: synthetic vascular access (SVA) as the initial vascular access; and arteriovenous fistulas (AVF) as the initial vascular access backed by synthetic vascular access.

Location/setting
USA/In-patient secondary care.

Methods
Analytical approach:
A state-transition decision analytic Markov model (using early cycles) was developed to estimate the costs and outcomes associated with the two interventions under study. The time horizon of the study was five years. The authors stated that a Medicare payer perspective was adopted.

Effectiveness data:
The authors reported that clinical and effectiveness data were derived from previously published studies and their own assumptions. Published studies were identified from a review of studies published in English between 1966 and 2008. The literature review was undertaken in MEDLINE. The key words used in the search were vascular access, polytetrafluoroethylene, arteriovenous fistula, haemodialysis and temporary catheters. The authors reported that articles were excluded if AVF or SVA were not examined separately. The main estimate of effectiveness was the complication rate after access, which was derived from the published literature.

Monetary benefit and utility valuations:
Quality of life estimates were obtained by asking patients undergoing haemodialysis to score complications from all types of vascular access using a Likert scale ranging from zero (death) to 10 (optimal health). Ten patients responded to these questionnaires.

Measure of benefit:
Quality-adjusted life-years (QALYs) gained. Future benefits were discounted using an annual rate of 3%. 
Cost data:
The direct costs included in the study were for: outpatient visits; in-patient stays; placement of AVF and SVA; surgical revision; treatment of sepsicaemia; placement of dialysis catheter; femoral catheter placement; anaesthesia; open thrombectomy; use of Permacath; and excision infected SVA. The authors reported that most of the costs were provided by Centres for Medicare and Medicaid Services. All costs were reported in USA dollars ($) and the price year was 2004. Future costs were discounted using an annual rate of 3%.

Analysis of uncertainty:
The authors undertook a series of one- and two-way sensitivity analyses to explore the impact of parameter uncertainty on the model's results. The authors reported that they particularly targeted the impact of utilities, AVF maturation rate, cost of AVF placement and complication rate of central venous catheters.

Results
Average cost per patient was $16,151 for AVF compared with $14,930 for SVA.

Average QALYs gained per patient was 2.19 for AVF and 2.06 for SVA.

Costs and benefits were combined using an incremental cost-utility ratio (additional cost per QALY gained). When compared to SVA, AVF was associated with an incremental cost of $9,389 per QALY gained.

The authors reported that the incremental cost-effectiveness ratio of AVF when compared to SVA exceeded $50,000 per QALY gained for AVF maturation rates of 36% or below.

Authors' conclusions
The authors concluded that AVF was cost-effective as long as the probability of AVF maturation was set at 36% or greater.

CRD commentary
Interventions:
The authors provided adequate details of the interventions under study. Comparator selection was appropriate: it was the recommended vascular access strategy according to national clinical practice guidelines in the authors setting and was likely to have been a relevant comparator in other settings.

Effectiveness/benefits:
The identification of published studies was based on a literature review in a single database (MEDLINE) and some details were given (included keywords, inclusions and exclusion). The methods used to the select studies from which data were derived and the references of these included studies were not reported by the authors so it was difficult to assess the quality of the clinical inputs in the study and whether some relevant evidence was missed. QALYs were an appropriate benefit measure given the impact of hypertension on both survival and quality of life and they enable comparisons with other disease areas. Utility estimates were derived from a very small patient sample (10 patients) and might be highly uncertain.

Costs:
The perspective adopted in the economic analysis was explicitly reported to be that of Medicare and it appeared that all relevant costs for the perspective were included in the analysis. The sources from which costs were derived were adequately reported. Price year, time horizon, discount rate and currency details were all reported.

Analysis and results:
A decision analytic Markov model was appropriate for synthesising cost and outcome information. Adequate details of the model were provided and included a graphical depiction. Uncertainty in the model results was tested using a series of one- and two-way sensitivity analyses. Probabilistic sensitivity analyses would have been a better method to evaluate overall model parameter uncertainty. As a main limitation to their analysis the authors reported that their assumptions made might not depict real practice.

Concluding remarks:
Overall quality of the study methodology was adequate and the results were reported sufficiently, but some details of the effectiveness data were not fully reported and this made it difficult to assess the appropriateness of the authors’ conclusions.

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