Choice of vascular access among incident hemodialysis patients: a decision and cost-utility analysis

Xue H, Lacson E, Wang W, Curhan GC, Brunelli SM

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 aim was to evaluate the cost-effectiveness of arteriovenous fistulas, compared with arteriovenous grafts, as the initial vascular access for patients starting haemodialysis. The authors concluded that fistulas produced greater overall survival and quality-adjusted survival than grafts, but the improvements were more modest than those reported in other literature. The methods, analyses, and results were selectively reported, making it unclear whether the authors’ conclusions are appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The aim was to evaluate the cost-effectiveness of choosing to use arteriovenous fistulas or arteriovenous grafts as the initial vascular access for patients starting haemodialysis.

Interventions
Arteriovenous fistulas were compared with arteriovenous grafts, placed immediately after the initiation of dialysis. In both strategies, catheters were used at the same time.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A decision-analytic Markov model was used to synthesise the data from a selection of relevant published studies. The time horizon was five years. The authors did not state the perspective.

Effectiveness data:
The effectiveness data were mainly from the Fresenius Medical Care North America (FMCNA) patient cohort. They were adjusted for the demographic case mix, co-morbid conditions, and other clinical features. The main clinical effectiveness estimate was survival in months. Access-related events, such as mechanical complications and infections, were reported, as was the percentage of patients with new arteriovenous access placed after maturation failure or permanent loss of patency.

Monetary benefit and utility valuations:
The utility data were from two published studies (Wasse, et al. 2007, and Brothers, et al. 2004, see ‘Other Publications of Related Interest’ below for bibliographic details) for patients with arteriovenous grafts, arteriovenous fistulas, catheters, and catheter-related morbidity.

Measure of benefit:
The measure of benefit was quality-adjusted life-months (QALMs), which were discounted at 3% per annum.

Cost data:
The direct medical costs included those of arteriovenous graft placement, arteriovenous fistula creation, angiography,
percutaneous intervention, catheter placement and removal, erythropoietin, and bloodstream infections, with in-patient and out-patient admissions, treatment costs, and follow-up care. The dosage of antibacterial medication was provided. These costs were from public Centers for Medicare and Medicaid Services data and published studies. They were discounted 3% per annum and reported in US dollars ($).

Analysis of uncertainty:
The model parameters were tested in one-way, two-way, and probabilistic sensitivity analyses. One-way analyses were performed on the arteriovenous fistula maturation rate, the relative risk of death, the utilities for percutaneous and surgical procedures and catheter states, and the cost of hospitalisation. The results were illustrated on the cost-effectiveness plane and in line graphs. An additional scenario was assessed with a crossover strategy where patients could change from arteriovenous fistula to arteriovenous graft or vice versa, when a repeat procedure was needed.

Results
Over five years, for patients starting dialysis, the undiscounted mean QALMs were 36.1 with arteriovenous fistulas and 32.5 with arteriovenous grafts; the incremental difference was 3.6 QALMs for fistulas over grafts.

The incremental cost-utility ratio for fistulas, compared with grafts, was $446 per quality-adjusted life-year.

The two-way sensitivity analyses showed that the utility scores for grafts needed to be between 0.09 and 0.15 higher than those of fistulas, for grafts to be more cost-effective. The probabilistic sensitivity analysis showed that it was more than 95% likely that fistulas would be cost-effective at a willingness-to-pay threshold of $50,000 per QALY. The crossover scenario produced improved overall survival and QALMs, compared with grafts, but fistulas produced better results than crossover.

The base-case findings were robust to variations in other model parameters.

Authors' conclusions
The authors concluded that arteriovenous fistulas produced greater overall survival and quality-adjusted survival than arteriovenous grafts, but the improvements were more modest than those reported in other literature.

CRD commentary
Interventions:
The two strategies were briefly described. The authors acknowledged that those patients referred for arteriovenous grafts were in poorer condition than those referred for arteriovenous fistulas. Arteriovenous grafts and fistulas might be suitable options in other settings.

Effectiveness/benefits:
: Survival and the transition probabilities were based on patient-level analyses of unpublished observational data. The validity of these data was uncertain, as acknowledged by the authors. No systematic review was reported, so it is unclear if the best available evidence was used. The methods and measurement tool for deriving the utility values were not reported and the relevant studies should be consulted to assess the internal validity of the utility data.

Costs:
The price year and the perspective were not reported, but a health provider perspective appears to have been taken. The unit costs were from publicly available sources and were clearly reported. The total costs for each strategy were not reported and the costs were not thoroughly tested in the sensitivity analyses. It was unclear if these costs were adjusted for inflation.

Analysis and results:
The analytic approach appears to have been appropriate, but only selected results were presented; the discounted results were not given. The values tested in the one-way sensitivity analyses were not reported, making it difficult to assess the extent of the variations in the key parameters.

Concluding remarks:
The methods, analyses, and results were selectively reported making it unclear whether the authors’ conclusions are appropriate.

**Funding**
Supported by a grant from the National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases.

**Bibliographic details**

**PubMedID**
20876675

**DOI**
10.2215/CJN.03210410

**Original Paper URL**
http://cjasn.asnjournals.org/content/5/12/2289.abstract

**Other publications of related interest**

Brothers TE, Cox MH, Robison JG, Elliott BM, Nietert P. Prospective decision analysis modeling indicates that clinical decisions in vascular surgery often fail to maximize patient expected utility. Journal of Surgical Research 2004; 120: 278-287.

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Arteriovenous Shunt, Surgical /economics; Costs and Cost Analysis; Humans; Markov Chains; Probability; Renal Dialysis /economics /mortality

**AccessionNumber**
22011000172

**Date bibliographic record published**
13/04/2011

**Date abstract record published**
25/05/2011