Magnetic resonance angiography in progressive renal failure: a technology assessment
Lawrence W F, Gris T M, Brazy P C, Fryback D G

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
Using magnetic resonance angiography (MRA) for renal artery stenosis (RAS) in patients with progressive renal failure (PRF).

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Patients (50 years old) with progressive renal failure (PRF) who were asymptomatic for vascular disease.

Setting
Nephrology clinic. The economic study was conducted in Wisconsin, USA.

Dates to which data relate
The effectiveness data were estimated based on a review of previously completed studies covering a period from 1983 to 1993. Nothing was reported with regard to the date of resource use data. The fiscal year was not specified.

Source of effectiveness data
Effectiveness data were derived via a review of previously completed studies.

Modelling
The authors employed a three-state Markov model to simulate the progression from PRF to end-stage renal disease (ESRD) and death in order to estimate benefits and costs. The model assessed two strategies:

1) observation of the cohort during decline in renal function using medical management, and supporting ESRD with either hemodialysis, peritoneal dialysis, or renal transplantation (the 'No Screen' branch); and

2) screening the entire cohort at the age of 50 years with MRA ('Screen' branch).

Outcomes assessed in the review
The outcomes assessed in the review were the probability of any nephrotoxicity, the probability of ESRD (in those with nephrotoxicity), prevalence of renal artery stenosis, mortality and success rates for surgery, mortality for percutaneous transluminal renal angioplasty (PTRA), utility values for PRF and ESRD, transition probabilities from PRF to dead,
PRF to ESRD for cohort and for treated RAS, ESRD to dead, and rates of decline of glomerular filtration rate (GFR) for cohort and treated RAS.

**Study designs and other criteria for inclusion in the review**
Not stated.

**Sources searched to identify primary studies**
A MEDLINE search was performed.

**Criteria used to ensure the validity of primary studies**
Not stated.

**Methods used to judge relevance and validity, and for extracting data**
Not stated.

**Number of primary studies included**
A total of 16 studies were used as references in the effectiveness analysis.

**Methods of combining primary studies**
Not reported.

**Investigation of differences between primary studies**
Not performed.

**Results of the review**
The results were as follows:

- probability of any nephrotoxicity was 0.20;
- probability of ESRD (in those with nephrotoxicity), 0.025;
- prevalence of renal artery stenosis, 0.15;
- mortality and success rates for surgery, 2.7% and 86.4%, respectively;
- mortality for PTRA, 2%;
- utility values for PRF and ESRD, 0.74 and 0.59, respectively;
- transition probabilities (in one year) from PRF to dead, 0.035;
- transition probabilities, PRF to ESRD for cohort, 0.424;
- transition probabilities, PRF to ESRD for treated RAS, 0.171;
- transition probabilities, ESRD to dead, 0.184;
- rates of decline of GFR for cohort and treated RAS, 11.6 mL/min/year and 3.15mL/min/year, respectively.
Methods used to derive estimates of effectiveness
Assumptions were also made by the authors and from expert opinion.

Estimates of effectiveness and key assumptions
It was assumed that MRA for RAS had a sensitivity of 0.85 and a specificity of 0.80 using a conservative estimate. The sensitivity and specificity of confirmatory renal artery angiography were assumed to be 1. It was assumed that the only toxicity due to confirmatory renal artery angiography was severe toxicity. Based on expert opinion, it was assumed that from those undergoing corrective procedure, 70% receive surgical treatment and 30% receive PTRA; the effectiveness of both procedures (surgical treatment and PTRA) was assumed to be equal.

Measure of benefits used in the economic analysis
The measure of benefits were quality-adjusted life years (QALYs).

Direct costs
Costs were discounted. Quantities were not reported separately from the costs. The cost items were reported separately. Direct health service costs were considered. The perspective adopted in the cost analysis was that of a third-party payer responsible for all the medical care costs. Charges were used as a proxy for the costs. The source of charge data for procedures was the study institution and represented the average charges to a series of patients during a 1-year period. The source of cost of ESRD was the literature, reflecting the average cost for all methods of therapy for ESRD. The date of the price data was not explicitly specified.

Indirect Costs
Not considered.

Currency
US dollars ($).

Sensitivity analysis
One-way and two-way sensitivity analysis, and threshold analysis (by specifying the challenge region for combinations of MRA sensitivity and specificity, and threshold analysis on other parameters) were performed on the parameters of the model.

Estimated benefits used in the economic analysis
Quality-adjusted life years (QALYs) were estimated to be 3.22 for the no screen strategy, 3.35 for MRA screen, and 3.37 for conventional angiography. The discount rate was 5%.

Cost results
The discount rate was 5%. The cost was estimated to be $128,815 for the no screen option, $129,107 for the screen option, and $129,279 for conventional angiography.

Synthesis of costs and benefits
Assuming a sensitivity of 0.85 and a specificity of 0.8 of MRA for RAS, the authors obtained an incremental cost-effectiveness of MRA screening compared to non-screening of $2,214 per QALY saved. The corresponding value for conventional angiography compared to no screening was $3,028. The sensitivity analysis established the robustness of the results in the range of reasonable values for almost all the parameters of the model.
Authors' conclusions
The use of MRA in PRF would be a worthwhile investment of resources in comparison with many currently funded procedures. The expense and morbidity associated with end-stage renal disease make any reasonable way of delaying or preventing the disease worth examining in detail.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparators is clear.

Validity of estimate of measure of benefit
The internal validity of the estimates of the benefit can not be objectively assessed due to lack of a comprehensive literature review and a quality assessment of the primary studies included.

Validity of estimate of costs
Resource utilisation was not reported separately from the costs. Adequate details of methods of cost estimation were not given. The study lacked a detailed cost analysis.

Other issues
In view of the lack of a comprehensive literature review and quality assessment of the primary studies included, and statistical analysis of the costs, the results may need to be treated with some caution.

Source of funding
Combination of grants from the Health Resources and Services Administration, General Electric Radiology Fellowship Award, Veteran's Administration Research Service, Veteran's Hospital Geriatric Research.

Bibliographic details

PubMedID
7747723

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Cost-Benefit Analysis; Humans; Kidney Failure, Chronic /etiology; Magnetic Resonance Angiography /economics; Middle Aged; Models, Biological; Models, Economic; ROC Curve; Renal Artery Obstruction /complications /diagnosis; Sensitivity and Specificity

AccessionNumber
21995000709

Date bibliographic record published
31/05/1999
Date abstract record published
31/05/1999