Cost-utility analysis of treatment algorithms for moderate grade vesicoureteral reflux using Markov models

Hsieh M H, Swana H S, Baskin L S, Meng M V

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 evaluated five treatment strategies for moderate grade vesicoureteral reflux (VUR) in girls and circumcised boys. The authors concluded that the "no antibiotic prophylaxis or follow-up imaging" strategy may constitute the least costly and highest utility treatment alternative. Overall, the methodology of the study appears, although the cost data and synthesis of the results could have been more fully reported. The authors’ conclusions seem appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The study evaluated five treatment strategies for moderate grade vesicoureteral reflux (VUR) in girls and circumcised boys.

Interventions
The five treatment strategies included:

- immediate surgery, where ureteral reimplantation was performed within a year of diagnosis;
- immediate endoscopy;
- early surgery, where ureteral reimplantation is performed if reflux has not resolved after 2 years of prophylactic antibiotics;
- Okeke-katz (OK) protocol, where patients take a year of prophylactic antibiotics, followed by endoscopy up to 2 times, then ureteral reimplantation for persistent VUR; and
- no antibiotic prophylaxis or follow-up imaging (NAPFI), where patients receive acute antibiotics for pyelonephritis but never receive prophylactic antibiotics or undergo follow-up imaging or surgery.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A Markov model was used to determine which of the five treatment strategies minimised morbidity and cost. The time horizon of the study was until all patients were cured of VUR. The authors stated the study perspective to be that of the medical institution.

Effectiveness data:
The effectiveness data came from published studies. The level of evidence (i.e. meta-analyses or randomised clinical trial, retrospective cohort or case-control study, case series, expert or consensus opinion) of the studies from which the effectiveness data were drawn was reported. The main clinical parameters were the proportion of patients with VUR, the probability of pyelonephritis and the probability of the resolution of VUR.
Monetary benefit and utility valuations:
The utilities associated with adverse events and interventions were taken from published studies that had determined parental preferences through the use of the standard gamble method.

Measure of benefit:
The primary measure of benefit was the utility associated with each treatment option.

Cost data:
The costs included were the average cost to the medical institution for each of the five treatment strategies. The costs were based on 2003 actual institutional costs and were reported in US dollars ($). An annual inflation rate of 3% was incorporated into the costs.

Analysis of uncertainty:
One and two-way sensitivity analyses were performed. The analysis was performed "by calculating the threshold at which a given value for a variable would change which treatment strategy featured the highest utility for a given grade of VUR".

Results
For VUR Grade II:

the average cost associated with the NAPFI procedure was $2,993, while the utility was 0.941;

for immediate surgery, the average cost was $19,479 and the utility value was 0.875;

for early surgery, the average cost was $15,378 and the utility was 0.834;

for immediate endoscopy, the average cost was $18,432 and the utility was 0.841;

for the OK protocol, the average cost was $16,441 and the utility was 0.829.

Similar results were obtained for VUR Grade III, although the costs were slightly higher and the utilities lower.

In both cases, NAPFI dominated all other strategies (i.e. it was less costly and more effective).

The costs and benefits were combined using an incremental cost-effectiveness ratio. However, the results of this analysis were presented in graphical format only.

Utility penalties for invasive imaging and outpatient pyelonephritis were the variables most important in determining which strategy provided the most utility.

Authors' conclusions
The authors concluded that the NAPFI strategy for the treatment of moderate grades of VUR may constitute the least costly and highest utility treatment strategy.

CRD commentary
Interventions:
The authors compared five treatment strategies for moderate grade VUR. However, it was not clear whether there were other strategies available that could have been considered in the analysis. The five treatment strategies were reported clearly.

Effectiveness/Benefits:
The effectiveness data were derived from published sources and were well reported. However, the methods of the review of the literature were not reported, which makes it impossible to ascertain if the best available evidence was used to inform the model. That said, the authors did report the evidence level for each of the studies providing inputs
for the model, which may help as a guide to the quality of individual parameters. The measure of benefit used seems appropriate, although only limited details were provided about how they were derived.

Costs:
The perspective was reported clearly and it appears that all the relevant costs were considered. However, the cost analysis was not transparent in its reporting as only the average costs for all patients in each treatment strategy were reported, rather than the costs and quantities of specific resources used. The price year was reported and costs in subsequent years were inflated, but the costs in future years were not discounted. The average costs were subjected to a sensitivity analysis.

Results and Analysis:
While the costs and outcomes were combined to produce incremental cost-effectiveness ratios, the results were only presented graphically which limits their interpretation. It might have been useful to the reader to have had the results tabulated. One- and two-way sensitivity analyses revealed that the results were generally robust. The authors acknowledged some limitations of their model.

Concluding remarks:
Overall, the methodology of the study appears appropriate, although the cost data and synthesis of the results could have been more fully reported. The authors' conclusions seem appropriate.

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