Use of internal stent, external transanastomotic stent or no stent during pediatric pyeloplasty: a decision tree cost-effectiveness analysis

Yiee JH, Baskin LS

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
This study examined the cost-effectiveness of an internal stent, an external transanastomotic pyeloureteral stent, or no stent for paediatric pyeloplasty. The authors concluded that external stents or no stent were superior to internal stents, and the decision on which to use should depend on their costs. The study had some methodological limitations that might affect the validity of the authors' conclusions.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of an internal stent, an external transanastomotic pyeloureteral stent, or no stent for paediatric pyeloplasty.

Interventions
The three strategies were internal stent, external stent, and no stent.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a deterministic decision-tree model, with a 16-year time horizon. The authors did not explicitly state the perspective adopted.

Effectiveness data:
The clinical data were from a review of the literature carried out in the PubMed database. Where multiple studies were available, the largest one was used to provide the base-case estimate. The data for no stent were based on evidence from the authors’ institution, while those for internal and external stents were from a previous study that compared their costs and effects. The rate of complications was the key input for the model.

Monetary benefit and utility valuations:
The utility values were based on authors’ opinions, as no data were found in the literature.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and a 3% annual discount rate was applied.

Cost data:
The economic analysis included the costs for a clinic visit and the direct medical costs of a paediatric pyeloplasty, which included hospitalisations, potential complications, and a second operation to remove internal stents. The costs of pyeloplasty were from the database of the University of California San Francisco (the authors' institution) and referred to the period from January to April 2010. The clinic costs were not directly available and were calculated from the billed cost multiplied by the average cost-to-charge ratio for the urology clinic. The costs were in US dollars ($).

Analysis of uncertainty:
Deterministic sensitivity analyses were carried out on the clinical inputs, using published ranges of values, and on the utility scores, using ranges of ±50% of their base-case estimates.

**Results**
The projected total costs were $6,122 with no stent, $5,702 with external stent, and $8,421 with internal stent. The QALYs were 12.70851 with no stent, 12.71098 with external stent, and 12.69983 with internal stent. The incremental analysis showed that the external stent dominated the two alternatives, as it was more effective and less expensive. No stent dominated the internal stent.

These conclusions held in the sensitivity analyses, with a few exceptions. When the external stent complications were 25% higher than in the base case, no stent was superior to the external stent at a cost of approximately $25,000 per QALY gained. Internal stents were not cost-effective, even in very favourable scenarios, due to the cost of a second operation to remove them.

**Authors’ conclusions**
The authors concluded that external stents and no stent were superior to internal stents. Their high success rates mean that the decision on which to use should depend on their costs.

**CRD commentary**

- **Interventions:**
  The selection of the interventions appears to have been appropriate. No stent was included and appears to have been a relevant strategy.

- **Effectiveness/benefits:**
  The authors used a valid approach to identify the relevant sources of data, as a review in a commonly used electronic database was undertaken. The inclusion and exclusion criteria were not stated and no limitations on the study design and patient population were reported. Larger studies were selected, but no information on their methods and other aspects, such as sample size and type of intervention, was reported. This makes it impossible to objectively assess the validity of the clinical inputs. No head-to-head clinical trial comparing the three options was found. QALYs were an appropriate benefit measure and they capture the impact of the disease on several aspects of patient health, including discomfort which is relevant for this patient population. There were no good published studies for the children’s utilities and the authors used their judgement to estimate these values.

- **Costs:**
  The economic analysis had some methodological limitations. The authors did not state the perspective, but it appears to have been that of the hospital. The costs were not broken down into individual items, but were presented as category totals, reducing the transparency of the analysis. No resource quantities were presented and the price year was not explicitly stated, but the costs were from 2010. Statistical analyses of the costs were not carried out and no sensitivity analyses were performed on these inputs.

- **Analysis and results:**
  The results were extensively presented and an appropriate incremental analysis was used to combine the costs and benefits of the strategies. The uncertainty was investigated, using a partial deterministic approach, which focused on selected inputs. A more comprehensive approach would have been useful. The 16-year time frame covered the children’s growth to adulthood. Discounting was applied to the benefits, but not the costs, which were presumably incurred by the hospital over a short period. The use of costs from a sample of patients undergoing the surgical procedure at the authors’ institution was good, but the sample size was not stated. The main limitation of the analysis appears to have been that the authors used their judgement for the utility weights. These were changed in the sensitivity analysis without a dramatic impact on the cost-effectiveness results, but there is a need for good utility values to corroborate the authors’ findings.

- **Concluding remarks:**
  The study had some methodological limitations that might affect the validity of the authors’ conclusions.
Funding
Supported by the National Institutes of Health.

Bibliographic details
Yiee JH, Baskin LS. Use of internal stent, external transanastomotic stent or no stent during pediatric pyeloplasty: a decision tree cost-effectiveness analysis. Journal of Urology 2011; 185(2): 673-681

PubMedID
21172705

DOI
10.1016/j.juro.2010.09.118

Original Paper URL
http://www.jurology.org/article/S0022-5347(10)04776-2/abstract

Indexing Status
Subject indexing assigned by NLM

MeSH
Child; Child, Preschool; Cohort Studies; Cost-Benefit Analysis; Decision Trees; Female; Humans; Kidney Pelvis/physiopathology/surgery; Male; Minimally Invasive Surgical Procedures/economics/instrumentation/methods; Postoperative Complications/economics/physiopathology; Prosthesis Design; Prosthesis Failure; Quality-Adjusted Life Years; Stents; Ureteral Obstruction/surgery; Urologic Surgical Procedures/economics/instrumentation/methods

AccessionNumber
22011000270

Date bibliographic record published
23/02/2011

Date abstract record published
20/04/2011