Intussusception in children: cost-effectiveness of ultrasound vs diagnostic contrast enema

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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
This study examined the cost-effectiveness of ultrasound triage before contrast enema for the diagnosis of paediatric intussusception. The authors concluded that ultrasound followed by contrast enema was more costly and more effective than contrast enema alone. Its cost-effectiveness was just within the societal willingness-to-pay threshold. The methods and reporting were appropriate. The authors’ conclusions appear to be conservative, but, given the high incremental cost-utility ratios, ultrasound followed by contrast enema might not be cost-effective for the third-party payer.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of ultrasound triage before diagnostic contrast enema for the diagnosis of paediatric intussusception.

Interventions
The two interventions were ultrasound followed if necessary by diagnostic contrast enema and diagnostic contrast enema alone.

Location-setting
USA/in-patient secondary care.

Methods
Analytical approach:
A Markov model with a one-year cycle length was used to simulate the costs and effects for a hypothetical cohort of 100,000 two-year-olds with suspected intussusception, based on their history, a physical examination, and a plain abdominal X-ray. The time horizon was until the patient died or reached 100 years old. The authors stated that a third-party payer perspective was taken.

Effectiveness data:
The clinical and effectiveness data were from a number of published studies. The main measure of effectiveness was the sensitivity and specificity of ultrasound in identifying intussusception. These data were from a number of published studies. Other key clinical inputs included the success rate in reducing intussusceptions using contrast enema, the contrast enema perforation rate, and the rates of radiation-induced cancers.

Monetary benefit and utility valuations:
The utility estimates for intussusception were from a study of seriously ill hospitalised patients (Tsevat, et al. 1995, see 'Other Publications of Related Interest' below for bibliographic details). The utilities for the other health states came from a study of individuals living with chronic medical conditions.

Measure of benefit:
The measure of benefit was quality-adjusted life-years (QALYs).

Cost data:
The direct health care costs were reported as short-term or long-term costs. The short-term costs were those of
evaluation for suspected intussusception, including in-patient care, emergency department care, and day surgery. These costs were from a national administrative database of observational data from 42 not-for-profit tertiary care paediatric hospitals in the USA. The long-term costs were those of radiation-induced cancer treatment, which were from the Surveillance, Epidemiology and End Results (SEER) cancer statistics review, published by the National Cancer Institute. All costs were reported in US dollars ($) and updated to 2008 prices, using the Centres for Medicare and Medicaid Services wage/price index. Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
One-way, two-way, and three-way sensitivity analyses were performed by varying each model parameter over a relevant range. All results were produced separately for male and female patients.

Results
For males, the average QALYs were 77.760 for contrast enema and 77.769 for ultrasound then contrast enema. For females, the average QALYs were 77.766 for contrast enema and 77.773 for ultrasound.

For males, the average cost per patient was $11,044 for contrast enema and $11,649 for ultrasound. For females, the average cost per patient was $11,008 for contrast enema and $11,626 for ultrasound.

Compared with contrast enema alone, ultrasound was associated with an incremental cost-utility ratio of $70,100 per QALY for males and $92,227 per QALY for females.

The results did not significantly change in the sensitivity analyses performed.

Authors' conclusions
The authors concluded that ultrasound was more costly and more effective than contrast enema alone. Its cost-effectiveness was just within the societal willingness-to-pay threshold and the contrast enema was associated with an increased risk of cancer.

CRD commentary
Interventions:
The interventions were clearly reported. The authors assumed that contrast enema was the diagnostic standard; this might not be the case in other settings.

Effectiveness/benefits:
The clinical and effectiveness data were from published studies. For each model parameter, the baseline value, the range, and the source reference or references were reported. No systematic review of the literature was reported, leaving it unclear if all the relevant information was included. QALYs were an appropriate benefit measure, given the impact of the disease on both survival and quality of life. They also allow comparisons to be made with other disease interventions. The authors did not state that the future QALYs were discounted and this was relevant for the lifetime horizon of the study. No information was provided on the methods used to measure and value the utility estimates, and the referenced paper should be consulted to assess them.

Costs:
The perspective was explicitly reported and it seems that all those costs relevant to the third-party payer perspective were analysed. The sources for these costs were reported, but the cost estimates were presented as category totals, which might hinder replication of the results for other settings. The authors reported the price year, time horizon, and appropriate discounting of future costs.

Analysis and results:
The costs and outcomes were synthesised in a Markov model. The details of the model were provided, including a diagram. The impact of uncertainty in the parameter estimates on the study results was partly evaluated in one-, two-, and three-way sensitivity analyses. A probabilistic sensitivity analysis could have captured more fully the overall parameter uncertainty and its effects on the model results. The authors reported a number of limitations to their analysis. The main one was that their results relied on uncertain evidence from the literature.
Concluding remarks:

The methods and reporting were appropriate. The authors’ conclusions appear to be conservative, but, given the high incremental cost-utility ratios, ultrasound followed by contrast enema might not be cost-effective for the third-party payer.

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Other publications of related interest

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