Cost-effectiveness of unenhanced MR imaging vs contrast-enhanced CT of the abdomen or pelvis
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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.

Health technology
Unenhanced MR imaging of abdomen or pelvis.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
Hypothetical cohort of patients needing abdominal or pelvic imaging, at risk for nephrotoxic effects induced by contrast material. Authors assumed that these patients could undergo either the diagnostic procedures.

Setting
Hospital. The economic study was conducted in Washington, Seattle, USA.

Dates to which data relate
Effectiveness data were mainly derived from studies published between 1989 and 1993. Costs were expressed in 1993 prices.

Source of effectiveness data
Review/synthesis of previously completed studies.

Modelling
Decision analysis was used in comparing the outcomes and medical care costs associated with the procedures analysed.

Outcomes assessed in the review
Outcomes were accuracy of diagnostic information and adverse events classified in severe adverse reactions (allergic-like and cardiac) and nephrotoxic effects (increases in the level of creatinine of 50% or more above baseline).

Study designs and other criteria for inclusion in the review
Large prospective trials were used.
Sources searched to identify primary studies
Not stated.

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

Methods used to judge relevance and validity, and for extracting data
For each main outcome the range of values (min. and max.) derived from the literature was reported.

Number of primary studies included
Outcomes were mainly derived from 6 studies.

Methods of combining primary studies
Where it would have been applicable - i.e. for some outcomes - studies were not combined and the most conservative estimates of probability values were used in the decision analysis model.

Investigation of differences between primary studies
Where it would have been applicable, this was not performed.

Results of the review
Diagnostic information provided by CT and MRI are equivalent. The point estimates used in the model for probability of nephrotoxic effects were 2% for low-risk patients and 9% for high-risk patients (defined as having one of more of the following conditions: renal insufficiency, diabetic nephropathy, or congestive heart failure) and the estimates used for probability of severe adverse reactions were 0.16% for high-osmolality and 0.003% for low-osmolality contrast agents.

Methods used to derive estimates of effectiveness
Authors’ assumptions were used.

Estimates of effectiveness and key assumptions
It was assumed that CT and MRI provide equivalent diagnostic information.

Measure of benefits used in the economic analysis
Probability of developing a severe reaction (allergic-like or cardiac) or nephrotoxic effects for high and low-risk patients.

Direct costs
Costs and quantities were not reported separately. Direct health service costs were considered: costs for CT, MR imaging, high- and low-osmolality contrast agents, for treating a severe adverse reaction. All costs were adjusted to 1993 prices using the medical consumer price index. Cost data were derived from the literature and from actual data (actuarial cost data from a medical centre).

Currency
US dollars ($).
Sensitivity analysis
One-way and two-ways sensitivity analyses were performed over a range of parameters estimates, including the risk of development and the average cost of treatment of nephrotoxic effects. Moreover, a further model considering cost and adverse effects of contrast material gadopentetate dimeglumine in MRI was developed.

Estimated benefits used in the economic analysis
Probability of nephrotoxic effects were 2% for low-risk patients and 9% for high-risk patients and the estimates used for probability of severe adverse reactions were 0.16% for high-osmolality and 0.003% for low-osmolality contrast agents.

Cost results
For the base-case analysis (i.e. patients at low risk), the costs per completed scan of CT with high-osmolality contrast agents, CT with low-osmolality contrast agents, and MR imaging were $245, $323, and $340, respectively. MRI with contrast material was $450. The average cost of treating a severe (allergic-like) adverse reaction was estimated to be $1200.

Synthesis of costs and benefits
For the base case, CT with high-osmolality contrast agent is the least costly imaging strategy. When the risk of nephrotoxic effects exceeds 5% for high-osmolality contrast agents or 2.6% for low-osmolality contrast agents, then MR imaging is the preferred strategy. MRI with contrast material was least costly than CT when the frequency of nephrotoxic effects was greater than 8% with high-osmolality and 6% with low-osmolality contrast agents.

Authors' conclusions
The authors concluded that MR imaging of the abdomen or pelvis is cost minimizing in patients at high risk for nephrotoxic effects. Use of low-osmolality contrast agents must reduce the frequency of nephrotoxic effects in high-risk patients by at least 50% to be less costly than MR imaging.

CRD Commentary
Interesting modelling exercise. More information on the designs of the primary studies considered, on criteria used to insure their validity would have added to the quality of this analysis; nevertheless, an overall good study.

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