An economic analysis of strategies for the use of contrast media for diagnostic cardiac catheterization

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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
High or low osmolality contrast media for cardiac angiography.

Type of intervention
Diagnosis.

Economic study type
Cost-utility analysis.

Study population
Hypothetical cohort of cardiac patients, assumed to be 55 years old. High risk patients were considered those with one or more of the following characteristics: unstable angina, severe coronary disease, active heart failure, myocardial infarction, valvular disease, allergies.

Setting
Hospital. The economic study was carried out in Canada.

Dates to which data relate
Costs and effectiveness data were largely collected from studies published in 1989-1992. 1990 prices were used.

Source of effectiveness data
Synthesis of previously published studies.

Modelling
A decision tree was used to estimate costs and benefits.

Outcomes assessed in the review
Main outcomes were the most severe non-fatal events such as incidence of myocardial infarction and stroke in patients after use of low or high osmolality contrast media.

Study designs and other criteria for inclusion in the review
A randomised trial, a cohort study and another unspecified study.
Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
These were not clearly stated but it seems that the largest studies were chosen.

Number of primary studies included
Two studies (of which one was a cohort study) were used to estimate the risk of severe non-fatal events of high and low osmolality media respectively. To estimate the risk of minor severe adverse events, a randomized controlled trial was used.

Methods of combining primary studies
Not combined. A comparison was made between the studies to estimate the difference of effectiveness using high-osmolality versus low-osmolality contrast media.

Investigation of differences between primary studies
Not stated.

Results of the review
There is no evidence for a reduction in mortality with low-osmolality media, but there is strong evidence for a reduction in lesser adverse effects. The use of low-osmolality media may reduce the incidence of myocardial infarction and stroke by 25%.

Measure of benefits used in the economic analysis
QALY gained. To estimate utilities, a constant reduction in quality of life was applied to life expectancy for all severe adverse events.

Direct costs
A 5% discount rate was used. Some costs and quantities were reported separately. The direct cost of treating a fatal event was assumed to be the same as the observed direct cost of treating a moderately severe event. The cost of treating stroke and myocardial infarction was estimated from data in the literature and application of local costs for such resources (based on the assumption that 14 days of inpatient care would be needed annually by a survivor). Trial data were used to determine the resources used during treatment of moderate adverse reactions, including: extra time spent in a hospital ward or intensive care; procedures such as insertion and maintenance of intra-aortic balloon pumps and pacemakers; treatment of cardiac arrests; use of medication and an estimate of nursing time for cardiac catheterization. The cost of coronary bypass surgery was ignored as the decision to treat was not based on the type of contrast media used. 1990 prices were used. Final costs were calculated using a decision tree. A telephone survey of 229 patients who had experiences of minor adverse effects was used to ascertain intangible costs to patients for the discomfort associated with adverse events. The approach used was to determine patients’ willingness to pay in order to avoid the certainty of future adverse events.

Indirect Costs
A 5% discount rate was used. The analysis was made from a societal perspective and the indirect costs included loss in wages from adverse reactions (based on Canadian taxable returns 1989). It was assumed that, on average, one day of productivity would be lost following a moderately severe adverse event.
Currency
Canadian dollars

Sensitivity analysis
One-way and two-way simple sensitivity analyses were performed on all the main underlying variables.

Estimated benefits used in the economic analysis
The life expectancy of a low-risk patient undergoing cardiac catheterisation was 13.7 years, and 10.38 for a high-risk patient. These values were then multiplied by an assumed quality of life of 0.7 to yield the number of QALYs following a severe event.

Cost results
These were reported only as disaggregated data, for each cost separately, and were used to cost the different branches of the decision tree. The time horizon was the lifespan of the patient after angiography.

Synthesis of costs and benefits
If the analysis considered direct costs to a third party payer only, the incremental cost per QALY gained with the use of low-osmolality contrast media in high-risk patients was $17,264 and in low-risk patients $47,874. When a societal perspective was used, the incremental cost per QALY gained by use of low-osmolality contrast media in high-risk patients was $649; and in low-risk patients $35,509. These estimates were sensitive to the cost and volume of the contrast medium employed and to the reductions in severe adverse events with low-osmolality media.

Authors’ conclusions
The authors concluded that limiting the use of low-osmolality media to high-risk patients was justifiable as the incremental cost per QALY in high-risk patients may be reasonable and it was not certain that low-osmolality media prevented severe or fatal events. They also reported that a considerable reduction in the cost per QALY gained was possible by minimizing the volume of contrast medium used.

CRD Commentary
The study is well documented but would benefit from: a) a more rigorous assessment of effectiveness; b) a more rigorous investigation of difference in QALYs that may arise.

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