The cost-effectiveness of diagnostic management strategies for adults with minor head injury

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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

The aim was to estimate the cost-effectiveness of a range of diagnostic management strategies for adults with minor head injuries. The authors concluded that computed tomography (CT) scanning, for minor head injury, based on a high sensitivity decision rule, was effective and could be cost saving. The Canadian CT Head Rule for high and medium risk patients appeared to be best. This was a comprehensive analysis with appropriate and clearly reported methods, and the authors' conclusions are appropriate.

Type of economic evaluation

Cost-effectiveness analysis, cost-utility analysis

Study objective

The objective was to estimate the cost-effectiveness of diagnostic management strategies, for adults with minor head injuries.

Interventions

The 10 diagnostic options were: discharge all patients, without testing; computed tomography (CT) for all patients; CT for patients with a Glasgow Coma Score (GCS) of less than 15 on arrival; the Canadian CT Head Rule (CCHR) for high risk patients; the CCHR for high or medium risk patients; the Neurotraumatology Committee of the World Federation of Neurosurgical Societies (NCWFNS) guidelines; the New Orleans Criteria (NOC); the National Emergency XRadiography Utilization Study II (NEXUS II) guidelines; the National Institute of Health and Clinical Excellence (NICE) guidelines; and the Scandinavian rule.

Location/setting

UK/secondary care.

Methods

Analytical approach:

A decision tree was used to represent patient pathways and combine the evidence from published literature, to simulate the outcomes, for patients with minor head injuries, aged 40 or 75 years, who presented to the emergency department. A lifetime horizon was specified and the authors stated that the perspective was that of the UK NHS and Personal Social Services in England and Wales.

Effectiveness data:

The sensitivity and specificity of the diagnostic strategies were from a large, unselected cohort validation study. The primary measure of patient outcome was their Glasgow Outcome Score (GOS), and the data were from several sources depending on the strategy and pathway. For patients with a neurosurgical injury, who received prompt treatment, a meta-analysis of studies identified by a systematic review was undertaken. For those, who received delayed treatment, and for those with a non-neurosurgical injury, where the lesion was detected on CT and the patient was admitted and appropriately treated, one relevant study was used. For those with a non-neurosurgical injury, where CT was not performed and the patient was discharged home without appropriate treatment, an assumption was needed due to a lack of evidence; it was assumed that the delay had a similar effect to that in the treatment of neurosurgical injuries, and the outcomes were adjusted accordingly. The mean life expectancy was from UK life tables.

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Monetary benefit and utility valuations:
A literature review was undertaken to identify studies that estimated the utility for each of the GOS states. The most relevant study was selected, based on its compliance with the NICE reference case methods. This was a study of long-term GOS outcomes and health-related quality of life, that used the EQ-5D questionnaire, with 87 patients who underwent CT for head injury.

Measure of benefit:
Quality-adjusted life-years (QALYs) were used to produce the ratio of cost per QALY. The utilities were discounted at an annual rate of 3.5%.

Cost data:
The costs were the direct costs of diagnostic management, which included investigations; CT scan; hospital admission and subsequent neurosurgical treatment; intensive care; nursing home care; rehabilitation for the severely disabled; and the treatment of glioma. The hospital costs and nursing home costs were UK Department of Health National Reference Costs. The long-term costs of care and rehabilitation were based on expert opinion. The rehabilitation costs were from the UK Personal Social Services Research Unit (PSSRU), and the costs of glioma were from one study. The costs were in UK £ and were discounted at an annual rate of 3.5%.

Analysis of uncertainty:
The authors used univariate sensitivity analysis to explore the impact of varying each parameter to the extremes of its confidence interval, or altering the discount rates for the costs and benefits to zero or 6% per year. Probabilistic sensitivity analysis was undertaken to explore the impact of the joint uncertainty in all the parameters.

Results
In adults aged 40 years, the mean costs of the different strategies ranged from £2,916 for the CCHR high and medium risk to £3,305 for discharge all. The mean QALYs ranged from 18.6669 for discharge all to 18.6913 for the CCHR high and medium risk.

The CCHR high and medium risk had an incremental cost-effectiveness ratio (ICER) of £3,879 per QALY gained, compared with the Scandinavian rule, which was the only other strategy on the cost-effectiveness frontier. Each of the other strategies was either dominated (more costly and less effective) or extendedly dominated (the cost-effectiveness ratio was greater than that of a more effective strategy).

In adults aged 75 years, the CCHR high and medium risk had an ICER of £10,397, compared with the Scandinavian rule.

Comparison of the best two strategies, at ages 40 or 75 years, in probabilistic sensitivity analysis, suggested that there was considerable uncertainty in these results.

Authors' conclusions
The authors concluded that CT scanning, for minor head injury, based on a high sensitivity decision rule, was not only effective, but also could be cost saving. The CCHR high and medium risk appeared to be best.

CRD commentary
Interventions:
The reporting of interventions was sufficient and the authors appear to have made considerable effort to ensure that all the relevant interventions were included. The interventions were generalisable to outside the UK setting.

Effectiveness/benefits:
The reporting of the effectiveness and benefits data was good and transparent. The methods used to identify the available data were comprehensive, which suggests that the best available data were used. The sources for the utilities for the estimation of the QALYs were well described. The source studies appear to have been assessed and selected based on their consistency with recommended methods for the study setting.

Costs:

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The cost categories were relevant to the stated perspective. The sources for the cost data were comprehensively reported and were relevant to the UK setting. The authors reported most of the adjustments made to the cost data, but they did not report the price year. The adjustments, such as the discount rate, seem to have been appropriate.

Analysis and results:
A full description and diagram of the model were presented. The rationale for the model was transparent and well described. The incremental approach used to compare all the available comparators was a robust and an appropriate method to assess the comparative cost-effectiveness of the options. The impact of uncertainty was appropriately considered in both univariate and probabilistic sensitivity analyses. The reporting of the results and the sensitivity analysis was good and the results appear to be generalisable. The authors discussed some of the key limitations of their study and they made comparisons with other relevant evaluations.

Concluding remarks:
This was a comprehensive analysis with appropriate and clearly reported methods. The conclusions reached by the authors are appropriate.

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