The economic impact of S-100B as a pre-head CT screening test on emergency department management of adult patients with mild traumatic brain 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
This study estimated the cost reduction associated with serum-100B testing to determine whether a computed tomography (CT) scan was required for adults with an isolated mild traumatic brain injury. The authors concluded that serum-100B testing had limited ability to reduce the number of CT scans and hospital costs, but the results depended on hospital characteristics, such as waiting times. There were a few limitations and the results were not reported in detail. The authors’ conclusions should be interpreted with caution.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The aim was to estimate the cost reduction associated with serum-100B testing, to determine whether a computed tomography (CT) scan was required, for adult patients with an isolated mild traumatic brain injury (mTBI) and a score of 15 on the Glasgow Coma Scale (GCS).

Interventions
Serum-100B testing to screen adults with a mTBI and a GCS score of 15, to determine whether a CT scan was needed, was compared with the usual care of a CT scan based on the patient's symptoms. Patients with a serum-100B level greater than 0.1μg per litre received a CT scan, whilst those with a level below 0.1μg per litre were discharged.

Location/setting
USA/secondary care.

Methods
Analytical approach:
The authors used a decision-analytic model to combine published evidence, to compare the alternative strategies. The authors stated that the perspective was that of the hospital payer. The time horizon was 48 hours.

Effectiveness data:
The effectiveness data came from a number of studies published after 1989; the selected studies had to contain 50 participants or more, to exclude case reports and case series. The main clinical parameters were the sensitivity and specificity of the serum-100B test and the probability of having a CT scan.

Monetary benefit and utility valuations:
Not applicable.

Measure of benefit:
The measure of benefit was the average costs saved per patient.

Cost data:
The direct costs included those of the serum 100B-tests, the CT scan and visits to the emergency department with or without observation, the cost of hospital admission, and the opportunity cost of bed occupancy and unnecessary treatment. The cost data were from Medicare reimbursements and published studies. The costs were presented in US
dollars ($) and the price year was 2007.

**Analysis of uncertainty:**

One-way sensitivity analyses were performed on the rate of CT scan, the time taken to receive the test results, and the cost of keeping a patient in the emergency department. Two-way sensitivity analyses were performed on combinations of these three cost drivers. The results of the two-way analyses were presented in graphs.

**Results**
The average cost per patient for the serum-100B testing strategy was estimated to be $218 compared with $160 for usual care.

One-way sensitivity analysis suggested that serum-100B testing could become cost saving if the proportion of mTBI patients receiving a CT scan (without testing) exceeded 0.782 or if the wait for the CT scan results was 96 minutes longer than that for blood test results.

The two-way sensitivity analyses indicated that an increase in the costs of time in the emergency department and/or an increase in the wait for the CT scan results made the testing strategy more favourable. If the rate of CT scan was increased (more patients received a scan without testing), the time saved by the testing strategy could be less for it to be cost saving.

**Authors’ conclusions**
The authors concluded that serum-100B testing had limited ability to reduce the number of CT scans and hospital costs, but it could do if a high proportion of patients received a CT scan without testing, or there were significant time costs or delays waiting for CT results.

**CRD commentary**

- **Interventions:** Both interventions were adequately described, and the analysis included the usual care, where patients were given CT scans on the basis of their symptoms, using standard guidelines.

- **Effectiveness/benefits:** The effectiveness data were from several published studies. The authors did not give the details of these studies, but they were identified by a literature search and some inclusion criteria were reported. The full methods of the literature search were not reported making it unclear if it was a systematic review and if all the best available evidence was included. The key effectiveness estimates were provided in a table with references. The methods used to derive the measure of benefit were not stated. It is unclear how generalisable this benefit measure would be to other studies.

- **Costs:** The authors reported the study perspective and appear to have included those costs relevant to this perspective. The sources of the cost estimates were relevant to the study and setting. The price year was stated and the key cost components and references were given in a table. The time horizon was chosen as the average period within which deterioration might occur. It might have been useful to extend this time horizon to seven days, as neurological deterioration in this period was rare, but still possible, and might have affected the cost estimates.

- **Analysis and results:** The analytic approach appears to have been appropriate and the model structure was presented in a diagram. The effectiveness data were only used to derive the transition probabilities and therefore the only results presented were the net costs for the interventions. Appropriate one- and two-way sensitivity analyses were performed, but probabilistic sensitivity analysis could have more thoroughly explored the parameter uncertainty.

- **Concluding remarks:** There were a few limitations to the study and the results were not reported in detail. The authors’ conclusions should be interpreted with caution.
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