Is computed tomography of nonvisualized C7-T1 cost-effective
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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
Computed tomography (CT) of the inadequately visualised C7-T1 level on conventional radiography was under evaluation. CT was implicitly compared with no screening.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who were treated at Thomas Jefferson University Hospital for blunt trauma from 1 January 1992 to 15 August 1996.

Setting
The setting was secondary care. The economic study was carried out in Philadelphia (PA), USA.

Dates to which data relate
The effectiveness data and resource use data were derived from a retrospective review of patients treated between 1992 and 1996. The price year was 1996.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the effectiveness analysis.

Study sample
No sample size calculations appear to have been performed in the planning phase of the study in order to assure a certain power. A retrospective review of 360 patients who were treated at Thomas Jefferson University Hospital for blunt trauma from 1 January 1992 to 15 August 1996 was performed. The patients underwent routine cervical spine radiography in which C7-T1 was not adequately visualised, but no radiographic evidence of injury was identified in the lower cervical spine. For all these patients, contiguous axial 3-mm image with sagittal reconstructions was used. The average age of the patients was 44 years (age range: 14 - 96) and the male-to-female ratio was 3.2:1.
Study design
This was a retrospective cohort study that was carried out in a single centre.

Analysis of effectiveness
The basis for the effectiveness analysis (intention to treat or treatment completers only) was not reported. The primary health outcomes were the number of total fractures identified, the number of unstable fractures identified, and the combined number of unstable and potentially unstable fractures identified. The control and experimental groups were represented by the same group of patients. The study looked at the same patients who had the CT scanning; the notes of these patients prior to CT scan were used to identify what was likely to have happened had they not had a CT scan, and estimated the presumed natural history of the injury without treatment.

Effectiveness results
Of the 360 patients, 11 (3.1%) had a C7-T1 injury identified by CT alone. These included six fractures of C6, eight fractures of C7, and three fractures of T1.

Five patients had fractures characterised as stable and treatable with cervical collar immobilisation.

Four fractures were judged potentially unstable and treatable with halo immobilisation for 6 to 8 weeks.

Two fractures were unstable and required surgical fixation.

Clinical conclusions
CT of inadequately visualised C7-T1 on routine radiography may show unstable and potentially unstable C7-T1. It is possible that subsequent treatment of these injuries may obviate potential sequelae of cervical arthritis, or prevent or limit neurologic injury.

Measure of benefits used in the economic analysis
The measures of health benefits were the same as those used in the effectiveness analysis. No summary benefit measure was used in the economic analysis.

Direct costs
The costs were calculated in the basis of the 1996 Medicare reimbursement rate of $280.87. The direct costs only included the costs of the scans. No discounting was applied. The price year appears to have been 1996.

Statistical analysis of costs
No statistical analysis of the costs was reported.

Indirect Costs
No indirect costs were reported.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analysis was not performed.
Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The cost of performing the 360 CT studies was $101,113. No discounting was applied.

Synthesis of costs and benefits
The benefits and costs were combined by calculating the cost per fracture identified, the cost per unstable fracture identified, and the cost per definitely and potentially unstable fracture identified. An incremental analysis was not performed. The cost-effectiveness of CT for averting potential sequelae was:

- $9,192 for each fracture identified,
- $16,852 for each definitely and potentially unstable fracture identified,
- $25,278 for each potentially unstable fracture identified, and
- $50,557 for each definitely unstable fracture identified.

Authors' conclusions
Computed tomography (CT) of inadequately visualised C7-T1 on routine radiography may show unstable and potentially unstable C7-T1. It is possible that subsequent treatment of these injuries may obviate potential sequelae of cervical arthritis, or prevent or limit neurologic injury. Given the relatively young age of the trauma population, and therefore the high associated rate of morbidity of these injuries over time, CT of the inadequately visualised C7-T1 appears cost-effective.

CRD COMMENTARY - Selection of comparators
The CT test was implicitly compared with no screening. Therefore, the study did not include any other health technology as a comparator. This was appropriate as the authors wished to justify the use of CT screening for nonvisualised C7-T1 level in their own setting. You should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The basis of the analysis was a retrospective cohort study without a separate control group. The authors argued that it would not be ethical not to carry out CT scans to determine the actual natural history of the injuries. Little information was given on the method used to select the sample. There was a lack of summary statistics for the patients.

Validity of estimate of measure of benefit
The number of fractures identified was used as the measure of health benefits. This was taken directly from the effectiveness analysis.

Validity of estimate of costs
The perspective of the study was not reported, but it appears to have been that of the third-party payer. The estimate of cost would vary with the selection of the sample and sample size, for example.

Other issues
The robustness of the results was not tested using sensitivity analyses. The issue of generalisability to other settings was
also not addressed. The authors did not consider other screening technologies such as magnetic resonance imaging. The authors reported some limitations of the study. For example, its retrospective nature, lost cases, and the use of Medicare reimbursement data to calculate the costs of performing the CT studies, which may not reflect the true costs of the study in terms of resources consumed. Also, the reliance on clinical experience with these types of injuries and a lack of true health outcome results.

**Implications of the study**
The authors suggested that CT of the inadequately visualised C7-T1 level on plain radiography was cost-effective, especially given the relatively young age of the trauma population and, therefore, the high associated morbidity of the sequelae of these injuries over time.

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**Other publications of related interest**


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