Computed tomographic scanning reduces cost and time of complete spine evaluation
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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
The use of computed tomographic (CT) scanning in the initial assessment of the thoracic, lumbar and sacral spine in blunt trauma patients.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised individuals admitted to the trauma burn service after being involved in car crashes, as either passengers or drivers, in more recent models of vehicles (6 years old or newer). The patients also had to have been restrained in some fashion to be included.

Setting
The setting was tertiary care. The economic study was carried out in Michigan, USA.

Dates to which data relate
The effectiveness data were derived from a study evaluating patients enrolled in the Crash Injury Research and Engineering Network (CIREN) and trauma registry databases between 1997 and 2000. Some of the resources used to undertake the tests were derived from another study, although the dates to which they related were not reported. The price year was not reported.

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

Link between effectiveness and cost data
The costing was undertaken prospectively on a different patient sample to that used in the effectiveness analysis.

Study sample
No sample size appears to have been determined in the planning phase of the study. In addition, no retrospective power calculations were reported. Patients who were enrolled in the CIREN database at the University of Michigan Trauma Burn Centre after being involved in car crashes were considered for the effectiveness analysis. To be included in the study, the patients had to undergo CT scanning of the abdomen, pelvis and chest for evaluation of intra-abdominal or thoracic injuries. They were also required to have had a complete spinal evaluation with plain radiographs after the
initial resuscitation and necessary stabilisation procedures. Among 207 patients included in the CIREN database, 55 trauma patients underwent CT scanning of the chest, abdomen and pelvis. Of these, 47 had a spine fracture and 28 had thoracolumbar fractures.

**Study design**
This was a diagnostic yield study that was carried out in a single centre. The patients were not followed-up since only the results from their CT scans and radiographs were used in the study.

**Analysis of effectiveness**
The outcomes assessed were:

- the number of plain radiographies reported by the attending radiologist as inadequate;
- the number of thoracolumbar spine fractures not seen on plain film; and
- the total number of injuries only identified on CT scan.

Each patient was used as their own control. Therefore, no comparison of the study groups was required.

**Effectiveness results**
Of the 55 patients who underwent plain radiography and CT scanning, the attending radiologist reported the plain films of 35 (63%) patients to be inadequate and CT scans were recommended.

Thirteen (24%) patients had thoracolumbar spine fractures not seen on plain film. A total of 33 injuries (13 patients) were identified only on CT scan.

**Clinical conclusions**
In reviewing the initial CT scans of the chest, abdomen and pelvis, the authors found several fractures that were not seen on plain films.

**Measure of benefits used in the economic analysis**
No measure of benefits was used in the economic analysis. The analysis was therefore categorised as a cost-consequences study.

**Direct costs**
The resource quantities and costs were reported separately. The direct costs considered in the economic evaluation were the costs of the tests. The average cost of each individual radiologic study included the costs of thoracic spine radiographs, CT scans and the radiograph (3 views) of the lumbar spine. The CT scans were of the thoracic spine (without contrast), chest (for trauma), abdomen (with contrast), lumbar spine (without contrast), pelvis (with contrast) and thoracolumbosacral spine series. The cost of initial CT scans covered CT scan of the chest for trauma, and CT scan of the abdomen and pelvis, both using contrast. The source of the direct costs was the Data Warehouse at the University of Michigan.

The average time spent by every patient for each radiologic study, and the overall time in the radiology department while undergoing routine radiologic evaluation after initial resuscitation, was also reported. These were obtained from an observational study in which 50 consecutive trauma patients were followed through their radiologic evaluation. In this study there were 35 men and 15 women, and the average age was 38.4 (+/- 16.5) years. The costs of transportation, travel time (nurses, respiratory therapists, hospital transporters), and the additional time and cost incurred when initial unsatisfactory films required additional studies, were not included in the economic evaluation. Discounting was unnecessary, as the costs were incurred during a short time, and was not performed. The study reported the average
costs. The price year was not reported.

Statistical analysis of costs
For the estimation of times, the authors provided mean values with standard deviations. However, the costs were treated as point estimates (i.e. the data were deterministic).

Indirect Costs
The indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analyses were performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
If CT scans alone were obtained, rather than plain radiographs followed by CT scanning, the costs would be reduced by more than a half (from $1,487 to $654).

Synthesis of costs and benefits
The costs and benefits were not combined.

Authors’ conclusions
The use of initial computed tomographic (CT) scans to screen the thoracic, lumbar and sacral spine for fractures in the blunt trauma patient would lead to cost-savings, as the number of additional radiographs and CT scans would be reduced.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used. In the authors' setting, the current standard of care for "clearing" the spine is plain radiographs, augmented with CT scans later if plain radiographs are inadequate. You should decide if this is a widely used health technology in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a diagnostic yield study, which was appropriate for the study question. The authors did not report any evidence that the study sample was representative of the study population. They also did not clearly define under what conditions a radiological test was considered to be inadequate, which might have introduced some bias into the assessment of this effectiveness outcome. Given these limitations, it is difficult to assess the internal validity of the analysis.

Validity of estimate of measure of benefit
No measure of benefits was used in the economic analysis. The analysis was therefore categorised as a cost-
Validity of estimate of costs
Although the authors did not report the perspective adopted in the economic study, it would appear that a hospital perspective was adopted. From this perspective, all the relevant categories of cost seem to have been included in the analysis. Several relevant costs were omitted from the analysis, such as transportation costs and the costs of travel time for nurses, respiratory therapists and hospital transporters. However, such omissions are unlikely to have affected the results since they may be the same for both test strategies considered at analysis.

The authors conducted a separate observational time study to evaluate the time spent in obtaining radiographic tests. However, the average costs calculated for the current tests and from CT scans alone do not appear to have been based on this time study but obtained, instead, by summing the average cost of each individual test typically performed for each patient. Moreover, it seems that the costs for the radiological test strategy might have been overestimated as, when they were estimated, it was considered that all patients undergoing radiological tests also had CT scans, whereas in real clinical practice only those patients with inadequate radiological tests would undergo CT scans.

No statistical or sensitivity analyses of the costs were performed. Therefore, there is uncertainty about the reliability of the cost estimation. Discounting was unnecessary, as all the costs were incurred during a short time, and was not performed. The price year was not reported, which will hamper any possible inflation exercise.

Other issues
The authors did not make appropriate comparisons of their findings with those from other studies. The issue of generalisability to other settings was not addressed. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis. The authors did not report any limitations to their study.

Implications of the study
The authors recommended using the data acquired from CT scans to evaluate the spine, supplementing them with additional tests only when further clarification is needed.

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None stated.

Bibliographic details

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Other publications of related interest


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Subject indexing assigned by NLM
MeSH
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