Limiting computed tomography to patients with peritoneal lavage-positive results reduces cost and unnecessary celiotomies in blunt trauma

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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 tomographic (CT) scanning used to identify patients with blunt trauma and positive results of diagnostic peritoneal lavage (DPL). Patients with a red blood cell count greater than 10711/L on lavage underwent CT. Patients with solid organ injury alone, as detected on CT scan, were observed. Those with evidence of hollow viscus injury underwent celiotomy.

Type of intervention
Diagnosis; screening.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with blunt trauma who required abdominal evaluation.

Setting
Hospital. The economic study was carried out in Seattle, Washington, USA.

Dates to which data relate
The main effectiveness data were extracted from a clinical trial conducted between 1993 and 1995. Resource and cost data were mainly derived from 1993-1995 sources. The price year was not clearly stated.

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

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness study.

Study sample
The study sample was a cohort of 4,643 patients divided into protocol and non-protocol groups with blunt trauma admitted to the trauma centre between July 1993 and June 1995. Only 67 patients (29 aged 29.1 years, 62% male in the protocol group and 38 patients aged 31.5 years, 71% male in the non-protocol group), with positive DPL results met the criteria for CT-guided management. Power calculations to determine the sample size were not stated.
Study design
The study was a non-randomised prospective case series. The duration of follow-up was not clearly stated but was likely to have been until discharge. The loss to follow-up was not stated.

Analysis of effectiveness
The analysis of the clinical study was based on completers only. The primary health outcomes used in the analysis were the sensitivity, specificity and accuracy of DPL, the numbers of DPL and CT performed and adverse effects. Patients in both groups (protocol and non-protocol) were well matched for demographic characteristics, initial vital signs and hematocrit indices. However, patients in the non-protocol group had higher ISS and higher rates of grossly positive DPL results.

Effectiveness results
The DPL test showed a sensitivity of 92%, a specificity of 98% and an accuracy of 98%. There were 67 patients with DPL results who met the criteria for CT-guided management (hemodynamically stable patients with a red blood cell count greater than 10^11/L on DPL). 38 patients underwent subsequent CT scanning and 29 underwent immediate celiotomy in violation of the protocol. 11 patients in the protocol group ultimately underwent celiotomy. Significantly fewer non-therapeutic celiotomies were performed in the protocol group (2/38 versus 9/29, P<0.01). There were no deaths in either group. There were 11 complications of DPL (1%) which resulted in 7 celiotomies and 3 CT scans. There were no complications attributable to CT.

Clinical conclusions
Limiting CT to the evaluation of patients with DPL-positive results and hemodynamic stability is safe and results in a lower rate of non-therapeutic celiotomies compared with DPL alone.

Measure of benefits used in the economic analysis
The measure of benefits was the number of non-therapeutic celiotomies and patient charges based on the difference between CT and DPL.

Direct costs
Patient charges for CT and DPL test were included. Quantities were analysed separately from prices. Discounting was not carried out. The quantity/cost boundary adopted was the hospital. The date to which the price refer was not clearly stated.

Statistical analysis of costs
Student t test, Mann-Whitney U test, Chi-squared analysis and P values.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was reported.

Estimated benefits used in the economic analysis
Significantly fewer non-therapeutic celiotomies were performed in the protocol group (2/38 versus 9/29, P< 0.01). The cost reduction was estimated to be $580,594 in patient charges as a difference between CT ($1,032) and DPL ($298).
Cost results
The total charges were $38,311 and $28,394 (P=0.26) in the non-protocol and protocol group, respectively.

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

Authors’ conclusions
Limiting CT to the evaluation of patients with DPL-positive results and hemodynamic stability was safe, reduced charges and resulted in a lower rate of non-therapeutic celiotomies compared with DPL alone.

CRD COMMENTARY - Selection of comparators
The reason for the choice of comparator is clear. DPL is a rapid, inexpensive and relatively sensitive screening test for the evaluation of blunt abdominal trauma. Alternatively, CT scanning is non-invasive and more specific than DPL and allows visualisation of the retroperitoneum and bladder.

Validity of estimate of measure of benefit
The data do not appear to have been used selectively.

Validity of estimate of costs
Adequate details of the methods of quantity/cost estimation were not given. The authors’ conclusions may be open to question as the study did not include a protocol for patients with a negative DPL. Furthermore, the authors noted that, as the non-protocol group had significantly higher ISS, the interpretation of the final outcome criteria is controversial as one would expect patients with more serious injuries to have a longer hospital stay and consequently increased hospital charges.

Other issues
The issue of generalisability to other settings was not addressed. However, appropriate comparisons were made with other studies, particularly in relation to complication rates. The results were not presented selectively.

Implications of the study
More research is required which includes measures in its protocol for patients who have a negative DPL result.

Source of funding
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