Surgical residents and ultrasound technician accuracy and cost-effectiveness of ultrasound in 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
Focussed Abdominal Sonogram for Trauma (FAST) performed by surgical residents as an essential diagnostic tool in the treatment of trauma patients.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
Trauma victims.

Setting
Hospital. The economic analysis was carried out in New York, USA.

Dates to which data relate
Effectiveness data corresponded to patients examined in the study institution between July 1996 and June 1997. The price year was not explicitly specified.

Source of effectiveness data
The evidence for the final outcomes was based on a single study.

Link between effectiveness and cost data
Costing appears to have been conducted retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were not used to determine the sample size. The study sample consisted of 697 trauma victims. FAST was performed on 650 (93%) of these patients (502 adult trauma and 148 paediatric trauma patients) on admission to the emergency department. The number of FASTs performed by US technicians was 527 (81%) (407 adult trauma and 120 paediatric trauma patients) versus 123 (19%) (95 adult trauma and 28 paediatric trauma patients) by surgical residents.
Study design
There were few details provided about the study design, but it appears to have been a retrospective study with concurrent controls, carried out in a single centre. The duration of the follow-up was not explicitly specified and loss to follow-up was not reported.

Analysis of effectiveness
The principle used in the analysis of effectiveness was not explicitly specified. The health outcomes were false positive, false negative and true positive, true negative, along with the accuracy of FAST compared with other diagnostic testing. The number of patients requiring follow-up studies was also reported. It is not clear whether the two groups of patients were comparable in their baseline characteristics.

Effectiveness results
The effectiveness results were as follows:

The study finding indicated that FAST was both specific (99%) and sensitive (68%) in the sample used.

Of the 650 patients undergoing FAST, true negative (TN) was 95%, true positive (TP) was 3% compared with false negative (FN) at 1%, and false positive (FP) at 0.5%.

The accuracy of FAST as performed by the US technicians was 96% versus 92% as performed by the surgical residents.

The mean accuracy of both was 94%.

The number of patients requiring follow-up studies was 64 (10% of the study sample); CAT scans were performed on 59 (9%) of these patients.

The CAT scan finding confirmed the initial findings of the original FAST in 83% of the study sample (49), resulting in a 67% TN and 39% TP.

In the remaining 10 (17%) cases, the CAT scan differed in results from the initial FAST. This resulted in a 73% FN and a 27% FP.

Clinical conclusions
FAST is an invaluable diagnostic tool in the primary survey of trauma victims. Furthermore, FAST as performed by surgical residents is an accurate method of evaluating the trauma patient.

Measure of benefits used in the economic analysis
No summary benefit measure was identified in the economic analysis, and only separate clinical outcomes were reported.

Direct costs
Costs were not discounted due to the short time frame of the cost analysis. Some quantities were reported separately from the costs and cost items were reported separately. Cost analysis covered the costs of a single fee for radiological readings, FAST as performed by the US technician, and CAT scan. The perspective adopted in the cost analysis was not explicitly specified. The price year was not explicitly specified.

Indirect Costs
Not included.
Currency
US dollars ($).

Sensitivity analysis
Not conducted.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
FAST as performed by residents incurred a single fee of $88 for radiological readings as compared with $274 for a US technician fee plus the radiological reading fee of $88. The cost of a CAT scan was $750. With the use of the US, the hospital savings can be projected to exceed $662 for each trauma patient screen before CAT scan testing. With the use of FAST in the present study, only 64 from 650 patients required further testing amounting to a total saving of $387,932.

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

Authors' conclusions
FAST as performed by surgical residents is more cost-effective than FAST as performed by US technicians. This includes the possibility of follow-up treatment and reduction of additional diagnostic testing resulting in efficient treatment of an individual by a single member of the trauma team.

CRD COMMENTARY - Selection of comparators
The strategy of using US technicians to perform FAST on trauma patients was regarded as the comparator since it was the procedure primarily used in the study institution. You, as a database user, should consider whether this is a widely used health technology in your own setting.

Validity of estimate of measure of effectiveness
The internal validity of the effectiveness results can not be guaranteed due to the non-randomised nature of the study design. Moreover, the patients in the US technician group outnumbered the residents' group by four times. In addition, the comparability of the two groups of patients was not investigated. The study sample appears to be representative of a broad study population (trauma patients irrespective of age). However, no inclusion or exclusion criteria were reported for the study sample, which makes it difficult to assess how representative the study sample was.

Validity of estimate of measure of benefit
The authors did not derive a measure of health benefit. The analysis may therefore be regarded as being of cost-consequences design.

Validity of estimate of costs
Some quantities were reported separately from the costs. Adequate details of methods of cost estimation were not given. As a result, it is not clear whether all important direct cost elements were included in the cost analysis. The price year was not specified. Using fees as opposed to true costs may have adverse effects on the validity of the cost results. The perspective adopted in the cost analysis was not specified. The effects of alternative procedures on indirect costs were not addressed. Statistical analyses were not performed on resource consumption or cost data. Cost results may not
be generalisable outside the study setting.

**Other issues**
The authors’ conclusions do not appear to be justified given the drawbacks inherent in the study design, and the lack of sensitivity analysis and statistical analysis of costs. The issue of generalisability to other settings or countries was not addressed, although some comparisons were made with other studies. The issue of whether the study sample was representative of the study population was not addressed.

**Implications of the study**
Despite the fact that the US technicians are very important in any radiology department for their work, the authors think that implementation of FAST by surgical residents allows maximal integration of clinical judgement in trauma situations. This conclusion, however, was based on weak evidence. Further research is needed to assess the cost-effectiveness of the proposed change in trauma diagnosis.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
10075311

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Abdominal Injuries /diagnosis; Clinical Competence; Cost-Benefit Analysis; False Negative Reactions; False Positive Reactions; General Surgery /education; Humans; Internship and Residency; Operating Room Technicians /economics; Tomography, X-Ray Computed; Ultrasonography /economics

**AccessionNumber**
21999000521

**Date bibliographic record published**
31/03/2001

**Date abstract record published**
31/03/2001