Penetrating neck trauma: sensitivity of clinical examination and cost-effectiveness of angiography


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 clinical examination and diagnostic screening angiography as indicators of vascular injury in patients with penetrating neck trauma.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with penetrating neck trauma. The mean age of patients was 29.9 years (+

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

Dates to which data relate
Effectiveness and resource data were collected between 1988 and 1992. Price years were not stated.

Source of effectiveness data
Single study.

Link between effectiveness and cost data
Costing was undertaken retrospectively on the same patient sample as used in the effectiveness study.

Study sample
131 patients with penetrating neck trauma. Of these 20 (15.2%) were excluded due to incomplete medical records. Power calculations were not used to determine sample size.

Study design
Single centre, retrospective chart review study (case series) in which each patient underwent both of the diagnostic procedures. The duration of follow up was 13.3 days on average. There was no loss to follow up.
Analysis of effectiveness
The analysis of the clinical study was based on treatment completers. The primary health outcome was the sensitivity and specificity of clinical examination and angiography as a means of identifying vascular injury.

Effectiveness results
Of the 111 patient examined, 48 were determined to have vascular injuries. Of these, 45 had abnormal findings by clinical examination, thus generating a sensitivity rate of 94% and a specificity rate of 51%. 48 patients had an angiogram as part of their initial treatment. 18 (37.5%) of this group had normal findings from their clinical examination. 15 of these (83.3%) had normal angiograms. The other three patients did not have their course of treatment altered by angiography. Overall no statistically significant difference was found between the sensitivities of angiography and clinical examination (P = 0.625, McNemar statistic).

For those patients with minor vascular injuries the clinical examination was more sensitive than angiography - magnitude difference in sensitivities was 0.125 (95% CI 0 - 0.4). The sensitivity of the clinical examination with respect to angiography, surgery and clinical follow-up in detecting significant vascular injury requiring a change in clinical management or clinical intervention was 0.95 (99% CI 0.91 - 0.99) and the specificity was 0.49 (99% CI 0.39 - 0.59).

Clinical conclusions
Clinical examination has an excellent rate of identifying significant vascular injuries and in particular for detecting minor vascular abnormalities. Clinical examination may make the use of screening angiography unnecessary.

Measure of benefits used in the economic analysis
Adverse central nervous system events prevented by additional screening.

Direct costs
Some costs and quantities were reported separately. Hospital costs were estimated from financial information from the hospital billing office. Specifically this included the costs of angiography and other resources utilised by the patient during the hospital stay. The cost of patient care was estimated as the multiple of charges for patient services and the hospital department's cost to charge ratio. The cost of health care and rehabilitation for stroke patients suffering a stroke at 35 and living for a further 35 years were estimated from a 1987 study. Price years and the costs of treatment and side-effects of the diagnostic tests were not stated.

Statistical analysis of costs
For some variables, median costs were reported, together with ranges and means.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analysis was performed on the incremental sensitivity of angiography compared to clinical examination, the incremental cost of angiography compared with clinical examination, the proportion of patients with normal clinical findings and percentage of adverse central nervous system events that would occur in patients not identified as having vascular injury. The confidence intervals were used as the range to perform the sensitivity analysis.

Estimated benefits used in the economic analysis
In the USA, 2.7 patients with adverse central nervous system events are estimated to be prevented each year by the use
of angiography (99% C.I. 0.9 - 4.5). The duration of benefits is the patient's lifetime.

**Cost results**
The median cost of angiography in patients with normal clinical findings was $1,542 (range $900 - $2,870, mean $1,672), which is the incremental cost due to angiography.

Median total hospital costs for patients who had an angiography, after normal clinical findings were $9,697 ($1,963 - $222,580, mean $19,217). In the USA, the incremental cost per year would be $8,326,800 (5,400 angiograms were estimated to be performed each year). The cost of treatment and rehabilitation for a stroke is estimated to be $1,050,000 over 35 years.

**Synthesis of costs and benefits**
The incremental cost of each additional adverse central nervous system event prevented by the use of angiography is estimated to be $3.08 million.

If the cost savings of avoided stroke treatment are included (2.7 x $1,050,000), then the incremental cost of each additional adverse central nervous system event prevented is $2.03 million. The incremental C-E ratio was particularly sensitive to the sensitivity of clinical examination (range $1.95 - $17.5 million) and the percentage of major adverse CNS events with unrecognised vascular injury (range $15.42 million to $616,800).

**Authors' conclusions**
Clinical examination has an excellent sensitivity at showing clinically significant vascular injury in patients with penetrating neck trauma. The cost of performing screening angiography in patients with no clinical evidence of vascular injury adds significantly to the cost of hospitalization and its practice is therefore questionable.

**CRD Commentary**
1. Discounting and price years were not stated, given the estimation over 35 years.

2. The study sample on which the study was based was small and may be biased. The authors themselves point out that a cohort of more than 300 patients would be required to generate significant sample size.

3. The median cost for treatment charges was used rather than the mean because a normal distribution of the data could not be assumed. This assumption may generate errors in incurred costs.

4. The authors themselves further note that the costs of adverse events not diagnosed are difficult to calculate.

5. The cost estimates were only based on a proportion of those patients included in the study.

6. Assessment of the clinical outcomes should have been blinded, but this was not stated by the authors.

**Implications of the study**
As stated by the authors a prospective, multi-institutional study is required to determine whether the conclusions of this study are indeed accurate.

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