Cost-effectiveness of routine screening for proximal deep venous thrombosis in acquired brain injury patients admitted to rehabilitation

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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
Routine ultrasound screening for proximal deep venous thrombosis (DVT). Techniques used were real time, spectral Doppler, and colour Doppler ultrasound.

Type of intervention
Screening; Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Traumatic brain injury (TBI) patients and non-traumatic brain injury (BI) patients. The average age of TBI patients was 34 years and that of BI patients was 56 years. The age range for all patients was 14-84 years. 77% of TBI patients were male, compared with 39% of BI patients.

Setting
The study was carried out at a university tertiary care rehabilitation centre. Cost analysis was carried out utilising charges acquired from the University of Alabama Hospitals, USA.

Dates to which data relate
Effectiveness analysis and resources used were based on data on admissions during the period July 1992 to September 1993. Prices seem to relate to 1993 charges.

Source of effectiveness data
The evidence for final outcomes was derived from a single study.

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

Study sample
164 patients (116 with TBI, 48 with BI) consecutively admitted to the Brain Injury Unit were recruited into the study. Patients with a clinically recognised and treated DVT were excluded. No mention was made of sample size adequacy or power calculations.
**Study design**
Prospective, case series study carried out in a single centre.

**Analysis of effectiveness**
The analysis of the clinical study was based on intention to treat. The primary health outcomes were detection of DVT and mortality. Groups were not shown to be comparable in terms of age or sex, nor does there seem to have been any adjustment for the differences in age or sex.

**Effectiveness results**
14 patients (8.5%) were found to have a DVT in the thigh or popliteal area: 9 in the TBI group (7.8%), and 5 in the BI group (10.4%). There was no statistically significant difference in the total number of detected proximal lower extremity DVTs between the TBI and BI groups. In the TBI group, 22 patients had associated lower extremity or pelvic fractures, but this factor appeared not to be significant because only one of the 22 was discovered to have a DVT. There was no significant correlation between the Glasgow Coma Score and the prevalence of DVT. There was no demonstrated difference in the prevalence of DVT due to age or sex in either the TBI or BI groups. However, there was a statistically significant difference between the TBI and BI groups with respect to age (p<0.0001) but not to sex.

**Clinical conclusions**
Clinically significant DVT appears to be relatively uncommon in BI patients admitted to rehabilitation, particularly traumatic, when compared with patients frequently admitted to rehabilitation with other medical diagnoses. When all tests for detecting DVT are available, duplex ultrasound is the most preferable because of its sensitivity, specificity, and low complication rate.

**Measure of benefits used in the economic analysis**
The outcome measure used in the economic analysis was lives saved. This was measured by taking an average age of 34 years, and assuming the average life expectancy to be approximately 43.5 years more.

**Direct costs**
Resource quantities were based on data collected at the study institution between 1992 and 1993, as well as published evidence from previous studies. The cost analysis was carried out utilising charges acquired from University of Alabama hospitals. 1993 prices appear to have been used.

**Currency**
US dollars ($).

**Sensitivity analysis**
A sensitivity analysis was carried out to test the cumulative effect of changing underlying assumptions for the cost effectiveness of the screening programme. The parameters concerned are sensitivity, specificity, screening for DVTs, treatment of patients with PE, progression from DVT to PE, and cost of DVT and PE. The methodology was not discussed.

**Estimated benefits used in the economic analysis**
The expected increase in mortality when DVT is clinically recognised is 0.521% for all BI patients. Undetected and untreated DVT may result in an estimated 0.876% increase in mortality secondary to PE in the acquired BI population. Years of life saved, on average, was assumed to be 43.5. This figure was based on the assumption of no decrement resulting from the TBI.
Cost results
The additional cost of screening for and treating the additional DVTs utilising colour Doppler ultrasound was conservatively estimated to be $674.84 (range: $851.31 - $176.81) per patient admitted to the BI rehabilitation unit.

Synthesis of costs and benefits
The cost per life saved for DVT screening for BI patients on admission to rehabilitation was $129,527.83. The cost per year of life saved was estimated at only $2,977.65. When changing underlying assumptions, it becomes clear that the only way to produce a cost saving for the screening programme would be to increase dramatically the cost of treating a PE relative to the cost of treating a DVT (i.e. from $13,646 to $19,913 for PE, and from $492 to $1,035 for DVT), along with a number of other limiting assumptions.

Authors' conclusions
DVT screening in this patient population appeared to be more cost effective than mass screening programmes for either breast cancer or colorectal cancer. The cost per year of life saved ($2,977.65) was lower than those costs proposed for comparable programmes with significant social support.

CRD Commentary
This was a useful study with the conclusions providing a strong argument for widespread adoption of DVT screening for BI patients on admission to rehabilitation. A number of factors could have improved the study. Firstly, due to the number of important assumptions underlying the study results, a more comprehensive sensitivity analysis would have improved the validity of the findings. Instead, the only analysis conducted was one which looked at the cumulative effect resulting from a number of limiting assumptions. Another issue is the calculation of the cost per year of life saved. This was based on the average life expectancy of 43.5 more years and no significant side-effects from the injury. However, costs of adverse effects, both direct and indirect, may be substantial, besides the potentially detrimental effect on quality of life. Thus, a cost utility study may be a useful addition to the results of this study. The study's external validity is questionable, given its specialised setting in a single US centre and the fact that it used charges rather than actual costs. Other issues include the lack of sample size calculations, and the uncontrolled nature of the study design.

Implications of the study
As mentioned previously, the generalisability of the findings is likely to be limited, particularly to other countries such as the UK. However, if similar findings can be replicated in the UK, the implications are very important for health policy, particularly given the conclusions that DVT screening for BI patients is more cost effective than mass screening programmes for either breast cancer or colorectal cancer. It could be very useful, if such research is not already being carried out, to initiate similar research in the UK setting.

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