The risk assessment profile score identifies trauma patients at risk for deep vein thrombosis

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 a risk assessment profile (RAP) to stratify trauma patients for deep vein thrombosis (DVT) prophylaxis, within 24 hours of admission, according to their potential for the development of DVT. The RAP is a scoring system that weights risk factors associated with an increased incidence of DVT. High-risk patients received both pharmacological(unfractionated heparin or enoxaparin) and mechanical prophylaxis. Surveillance duplex Doppler scans were performed each week during hospitalisation, or if symptoms developed.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised trauma patients aged more than 18 years, who were expected to stay longer than 36 hours, and had a RAP score of more than 2. Patients were excluded if they had a known hypercoagulable state, if they were pregnant, lactating, incarcerated, or if they had undergone heparin, warfarin or low-molecular weight heparin therapy.

Setting
The setting was secondary care. The economic study was carried out in the Departments of Surgery and Pharmacy Services at the University of Cincinnati College of Medicine and at the University of Michigan Medical Centre, Ann Arbor, USA.

Dates to which data relate
The effectiveness data and resource use were gathered between November 1998 and May 1999. The price year was not explicitly stated, although hospital charges were used to compute savings during the study period.

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

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used for the effectiveness study. Resource use was individually recorded for every patient and hospital charges were assigned.

Study sample
No power calculations to determine the sample size were reported. The trauma surgeons saw a total of 314 patients, of which 184 (59%) met the study criteria and were enrolled. Twenty-four patients did not complete the study because of a protocol violation, or because a final Duplex study was not obtained. The study sample therefore comprised 160 participants (87%) who completed all phases of the study. Of these, 58 (36.3%) with a RAP score between 2 and 5 were stratified to the low-risk group, while 102 (63.8%) with a RAP score greater than 5 were stratified to the high-risk group. There were no statistically significant differences in gender between the high- and low-risk groups. However, patients in the high-risk group were statistically significantly older (43.7 years) than those in the low-risk group (34.2 years), \( p<0.05 \).

**Study design**
This was a prospective observational study that was conducted in two medical centres. The duration of follow-up was 30 days and the drop-out rate was 13%.

**Analysis of effectiveness**
The analysis of the effectiveness study was conducted on the basis of treatment completers only. The primary outcomes were the identification of patients at low and high risk of developing DVT, based on the RAP score, and the development (or otherwise) of DVT during hospitalisation.

**Effectiveness results**
Eleven of the 102 patients (10.8%, 95% confidence interval, CI: 5.5 - 18.5) in the high-risk group had a DVT diagnosed by Doppler scan versus none of the 58 patients (0%, 95% CI: 0.0 - 6.2) in the low-risk group, \( p=0.077 \). Five of the 16 RAP factors were statistically significant for DVT. These factors were obesity, transfusion of more than 4 units, operation of longer than 2 hours, head abbreviated injury score of greater than 2. and complex lower extremity fracture.

**Clinical conclusions**
The RAP score correctly identified patients at an increased risk of developing DVT.

**Measure of benefits used in the economic analysis**
The authors did not develop a summary of benefit for use in the economic analysis. A cost-consequences analysis was therefore conducted.

**Direct costs**
Discounting was not relevant due to the short duration of follow-up. The quantities and the costs were not reported separately, only a total saving cost per patient was reported. The direct costs were the hospital charge of bilateral venous Doppler examination, the charges of unfractionated heparin and low molecular weight heparin, and the charge of the pneumatic compression device and arteriovenous foot pump. A price year was not explicitly reported. The cost/quantity boundary adopted for the costing was that of the hospital.

**Statistical analysis of costs**
No statistical analysis of the costs was reported.

**Indirect Costs**
No indirect costs were included.

**Currency**
US dollars($).
Sensitivity analysis
No areas of uncertainty were identified or investigated.

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

Cost results
The total cost of the intervention per patient was not reported. The total saving in hospital charges for the whole low-risk group was $18,908.

Synthesis of costs and benefits
The costs and benefits were not combined due to the cost-consequences approach adopted.

Authors’ conclusions
The study validated the risk assessment profile (RAP) score for stratifying trauma patients as low or high risk for the development of deep vein thrombosis (DVT). The protocol avoided prophylaxis in the low-risk group, thus reducing the hospital charges.

CRD COMMENTARY - Selection of comparators
The comparator was not explicitly stated. However, by implication, the study only made a comparison between the RAP cost-savings of not applying prophylaxis and monitoring to low-risk patients. It was not stated whether applying prophylaxis to all low-risk patients was standard practice and/or the comparator.

Validity of estimate of measure of effectiveness
The authors adopted the number of patients who developed DVT as the measure of effectiveness when allocating patients to the two groups using the RAP score. This appears to have been a valid measure of effectiveness. The analysis of effectiveness was handled credibly and the study was well designed and reported. Appropriate statistical analyses were conducted and the results were presented clearly.

Validity of estimate of measure of benefit
No summary measure of the benefits was used as the authors undertook a cost-consequences analysis.

Validity of estimate of costs
The resource quantities were not reported separately and the authors limited their analysis to some direct costs. The cost estimates are likely to be specific to those hospital settings as hospital charges were used.

Other issues
The authors made good comparisons of their results with those of published research. They identified age, high Injury Severity Score and blood transfusion within the first 24 hours as factors significantly associated with thrombosis. However, the study did not report that it controlled for variables (e.g. age) at baseline. The costs of implementing the guidelines were not included. A more detailed costing exercise would have been more informative for the decision-maker. Detailed descriptions of resource use would have helped the transferability of the findings to other settings. The results of the study should be viewed with some caution given the scope of the costing and the possibility of confounding.
Implications of the study
In terms of clinical practice, the results suggested that prophylaxis and monitoring is unnecessary for patients at low risk (according to the RAP score). The authors stated that additional studies of DVT prophylaxis are needed to identify more efficacious agents to further reduce DVT after injury.

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