A probabilistic cost-effectiveness analysis of enoxaparin versus unfractionated heparin for the prophylaxis of deep-vein thrombosis following major 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.

CRD summary
This study assessed the cost-effectiveness of enoxaparin compared with unfractionated heparin (UH) for the secondary prevention of deep vein thrombosis in patients who had experienced major trauma. When final endpoints, such as life-years gained, were the measure of benefit, UH was the dominant strategy. This appears to have been a well conducted evaluation which was clearly and transparently reported. The conclusions reached by the authors appear to be appropriate.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The aim was to compare the cost-effectiveness of two treatment options for the prophylaxis of deep vein thrombosis (DVT) in patients who had experienced major trauma, with a severity score of nine or more.

Interventions
The interventions were enoxaparin 30mg daily compared with unfractionated heparin (UH) 5,000 units daily. All patients requiring treatment for DVT were assumed to receive intravenous UH at a mean dose of 30,000 units per day.

Location/setting
Canada/secondary care.

Methods
Analytical approach:
A probabilistic decision analytic model, which included both the diagnosis and management of DVTs, was used to evaluate the two prophylactic treatments. The patients’ life-time was the time horizon and the authors reported that the perspective was that of the third-party payer.

Effectiveness data:
The effectiveness data were obtained from a literature review. The criteria applied for the selection of the estimates, the process used to identify the data, and the sources searched were all reported. The main clinical parameters included the rate of proximal DVT and pulmonary embolism (PE) for each prophylactic treatment, the major bleeding events during prophylaxis and during DVT treatment with UH, the death rates due to major bleeding, DVT, PE and PE treatment failure, the sensitivity and specificity of clinical diagnosis of DVT and B-mode ultrasonography, and life expectancy.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The measures of benefit were DVT cases averted and life-years gained (LYG). LYG were discounted using an annual rate of 5%.

Cost data:
The cost categories were the cost of prophylaxis treatment including administration costs, hospitalisation costs including
intensive care, and the cost of diagnostic procedures such as chest x-rays and spiral computer tomography. The unit costs, resource use and length of stay data were presented. All costs were based on actual data and were obtained from official sources. They were reported in Canadian dollars (CAD) for the price year of 2003.

Analysis of uncertainty:
A probabilistic analysis was conducted using a Monte Carlo simulation. All the parameters were assigned distributions, with the exception of costs, and these distributions were reported. One- way and two-way sensitivity analyses were performed on both the costs estimates and the discount rate.

Results
Enoxaparin resulted in 16.92 LYG per patient treatment and UH resulted in 17.05 LYG. The enoxaparin treatment averted 0.085 more DVTs compared with UH, which equates to 85 for 1000 patients.

The mean total hospital stay cost for enoxaparin treated patients was CAD 12,686 compared with CAD12,596 for UH treated patients.

Enoxaparin resulted in an incremental cost of CAD 90 compared with UH, and in an incremental cost-effectiveness ratio (ICER) of CAD 1,059 per DVT averted.

In terms of LYG enoxaparin was dominated because it was more costly and less effective.

The probabilistic sensitivity analysis demonstrated that, in terms of DVTs averted, enoxaparin was more effective in 98% of the iterations and had a 51% probability of being more effective and less costly than UH. These results were reversed for LYG where UH was the dominant strategy in 46.9% of the iterations (more effective and less costly than enoxaparin) with a 95% chance of being more effective than enoxaparin.

The deterministic sensitivity analyses demonstrated that these results were robust to changes in the cost parameters. The most sensitive parameter was the discount rate.

Authors’ conclusions
The authors concluded that the cost-effectiveness of the two treatment options was highly dependent on the measure of benefit used. In the case of intermediate endpoints, such as the DVTs averted, enoxaparin was a cost-effective option, whilst for LYG, the final endpoint, UH appeared to be the dominant strategy (more effective and less costly).

CRD commentary
Interventions:
The interventions were clearly and fully described and it would appear that relevant comparators including the current practice were considered.

Effectiveness/benefits:
The effectiveness data were obtained from randomised controlled trials and the selection of these trials was justified. The search methods, inclusion criteria and some relevant details of these trials were reported, all of which enhances the validity of the estimates obtained. The use of both intermediate and final outcomes clearly demonstrated the importance of this issue. It is not clear why the authors did not use a utility outcome, such as quality-adjusted life-years.

Costs:
The costs appeared to reflect the perspective. The resource use and the cost data were well reported and appeared to be appropriate for the population and setting. The price year was reported, which will aid relation in the future. The time horizon was short (12 months) so discounting was not relevant.

Analysis and results:
The model structure was presented graphically along with the relevant details and modelling assumptions. The authors conducted an incremental analysis and extensive sensitivity analyses on the modelling parameters and the results were appropriately presented, which enhances the generalisability of the findings. Overall the level of reporting was good.
The authors compared their results with those of two economic modelling studies, both of which used the same clinical trial data as this model. They found variable results, some similar, and some different, which seemed to be a result of the inclusion and exclusion of different factors within each model. The authors did not highlight any limitations to their study, they stated that this was the most comprehensive and methodologically sound cost-effectiveness analysis of these treatments to date.

Concluding remarks:
This appears to have been a well conducted evaluation which was clearly and transparently reported. The conclusions reached by the authors appear to be appropriate.

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