Economic impact of enoxaparin versus unfractionated heparin for venous thromboembolism prophylaxis in patients with acute ischemic stroke: a hospital perspective of the PREVAIL trial

Pineo G, Lin J, Stern L, Subrahmanian T, Annemans L

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 examined the clinical and economic impact of enoxaparin versus unfractionated heparin, to prevent venous thromboembolism, after an acute ischaemic stroke. The authors concluded that the higher cost of enoxaparin was offset by fewer clinical events, compared with unfractionated heparin, particularly for patients with more severe stroke. The study focused on the economic data and was satisfactorily carried out. The authors' conclusions appear to be robust.

Type of economic evaluation

Cost-effectiveness analysis

Study objective

This study examined the clinical and economic impact of enoxaparin versus unfractionated heparin, to prevent venous thromboembolism, after an acute ischaemic stroke.

Interventions

The low-molecular weight heparin, enoxaparin 40mg, once daily, was compared with unfractionated heparin 5,000 units, twice daily. Prophylaxis lasted for 10 days.

Location/setting

USA/hospital.

Methods

Analytical approach:

The analysis was based on a decision tree that used data from a clinical trial. The time horizon was 90 days and the authors stated that the perspective of the hospital was adopted.

Effectiveness data:

The clinical data on the efficacy and safety of the two treatments were from a published open-label, randomised controlled trial; the Prevention of Venous Thromboembolism After Acute Ischemic Stroke with Low-Molecular-Weight Heparin and Unfractionated Heparin (PREVAIL) trial (Sherman, et al. 2007, see 'Other Publications of Related Interest' below for bibliographic details). The number of venous thromboembolisms, including deep vein thrombosis (DVT) and pulmonary embolism, was the primary endpoint of the analysis.

Monetary benefit and utility valuations:

Not considered.

Measure of benefit:

No summary benefit measure was used. The rates of venous thromboembolism and pulmonary embolism were the main outcomes of the analysis.

Cost data:

The economic analysis included the costs of prophylaxis and the treatment of venous thromboembolisms. The drug costs were estimated, using their average wholesale prices and the dosages used in the PREVAIL trial. An

administration fee was added for each dose. The costs of clinical events were estimated using a multivariate cost-evaluation model, based on the mean hospital costs from a database of over 600 hospitals representing all geographical areas of the USA. All costs were in US $ and the price year was 2008.

Analysis of uncertainty:
Subgroup analyses were carried out by severity of stroke, measured on the National Institutes of Health Stroke Scale (NIHSS); less severe was a score of less than 14, and more severe was 14 or more. Sensitivity analyses were performed to examine the impact of variations in the cost inputs and the clinical event rates, on the total costs. Alternative values for the inputs were defined by the authors. In a Monte Carlo simulation, all the parameters were simultaneously varied within beta distributions for the clinical events and gamma distributions for the costs.

Results

The total costs were $782 ($422 hospital costs and $360 drug costs) with enoxaparin and $922 ($662 hospital costs and $259 drug costs) with unfractionated heparin. The average savings were $140 per patient with enoxaparin. The savings were $71 for patients with less severe stroke, and $287 for those with more severe stroke.

The rates of venous thromboembolism were 10.2% with enoxaparin and 18.1% with unfractionated heparin (p=0.0001). With less severe stroke, the rate of DVT was 0.081 with enoxaparin and 0.1356 with heparin, and the rate of pulmonary embolism was 0.002 with enoxaparin, and 0.004 with heparin. With more severe stroke, the rate of DVT was 0.1625 with enoxaparin and 0.2914 with heparin, and the rate of pulmonary embolism was zero with enoxaparin and 0.0229 with heparin.

Enoxaparin remained cost saving in all the deterministic scenarios and the probabilistic sensitivity analyses.

Authors' conclusions

The authors concluded that the higher cost of enoxaparin was offset by fewer clinical events, compared with unfractionated heparin, particularly for patients with more severe stroke.

CRD commentary

Interventions:
The rationale for the selection of the comparators was clear, as the two available prophylaxis regimens for patients with acute ischaemic stroke were considered.

Effectiveness/benefits:
The clinical analysis was based on the results of the published PREVAIL trial (Sherman, et al. 2007). The key features of this trial were reported and the design of a head-to-head randomised trial should ensure the internal validity of these data. This trial focused on patients who were at a high risk of venous thromboembolism, where previous trials had assessed general medical patients.

Costs:
The categories of costs were consistent with the hospital perspective as stated. The database of more than 600 hospitals, from different US areas, that supplied most of the economic data, was a valid source and reflected the analysis setting. The resource use data from the clinical trial might not be representative of real-world clinical practice as the authors acknowledged. The costs per event were reported and these were varied in the sensitivity analysis. The price year was given, allowing reflection exercises.

Analysis and results:
The results were clearly presented for the whole patient population and for the subgroups of patients. Cost-effectiveness ratios were not calculated, but enoxaparin would have been dominant, as it was more effective and less expensive than unfractionated heparin. Appropriate sensitivity analyses were performed to assess uncertainty, and the methods and results were clearly reported and discussed. The results appear to be specific to the USA and cannot be directly transferred to other countries.

Concluding remarks:
The study focused on the economic data and was satisfactorily carried out. The authors' conclusions appear to be robust.

Funding
Funded by sanofi-aventis, USA, manufacturer of enoxaparin.

Bibliographic details
Pineo G, Lin J, Stern L, Subrahmanian T, Annemans L. Economic impact of enoxaparin versus unfractionated heparin for venous thromboembolism prophylaxis in patients with acute ischemic stroke: a hospital perspective of the PREVAIL trial. Journal of Hospital Medicine 2012; 7(3): 176-182

PubMedID
22058011

DOI
10.1002/jhm.968

Original Paper URL
http://onlinelibrary.wiley.com/doi/10.1002/jhm.968/abstract

Other publications of related interest
Sherman DG, Albers GW, Bladin C, et al. The efficacy and safety of enoxaparin versus unfractionated heparin for the prevention of venous thromboembolism after acute ischaemic stroke (PREVAIL study): an open-label randomised comparison. Lancet 2007; 369: 1347-1355.

Indexing Status
Subject indexing assigned by NLM

MeSH
Acute Disease; Anticoagulants /administration & dosage /adverse effects /economics; Cost Savings; Cost-Benefit Analysis; Databases, Factual; Decision Support Techniques; Enoxaparin /administration & dosage /adverse effects /economics; Heparin /administration & dosage /adverse effects /economics; Hospital Costs; Humans; Outcome Assessment (Health Care) /methods; Stroke /complications /drug therapy; United States; Venous Thromboembolism /etiology /prevention & control

AccessionNumber
22012011384

Date bibliographic record published
28/05/2012

Date abstract record published
07/01/2013