The cost-effectiveness of low-molecular-weight heparin vs unfractionated heparin in general and orthopaedic surgery: an analysis for the German healthcare system

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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
Low molecular weight heparin (LMWH) and unfractionated heparin (UFH) in general and orthopaedic surgery.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
German patients undergoing general or orthopaedic surgery.

Setting
Hospital. The economic study was carried out in Germany.

Dates to which data relate
Effectiveness estimates were derived from studies published between 1981 and 1995. Resource use data were collected from studies published between 1994 and 1997. Cost data were derived from 1992-1997 sources. The price year was not reported.

Source of effectiveness data
The source of effectiveness data was a review/synthesis of previously completed studies.

Modelling
A deterministic, decision-tree, analytic model was used to determine the cost-effectiveness of the two post-operative thromboprophylactic agents.

Outcomes assessed in the review
The review assessed the following outcomes: the occurrence of deep vein thrombosis (DVT), pulmonary embolism (PE), and major bleeding complications (BC), diagnosis rates, mortality rates, life expectancy, and number of days of hospitalisation.

Study designs and other criteria for inclusion in the review
The data on the occurrence of pathophysiological events were derived from a meta-analysis comprising randomised
studies.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
At least 9 primary studies were included.

Methods of combining primary studies
Narrative method.

Investigation of differences between primary studies
Not reported.

Results of the review
50% of all true positive PEs are detected without the previous diagnosis of DVT. The false positive rate of clinical bedside diagnosis was 10% for DVT and 2% for PE. For all surgical studies, the relative risk of DVT was 0.74 (95% CI: 0.65 - 0.86), of PE was 0.43 (95% CI: 0.26 - 0.72), and of major bleeding was 0.98 (95% CI: 0.69 - 1.4). The mortality of DVT and PE were 0.6% and 8%, respectively. The average life expectancy of patients was 35 years. The incremental prolongation of hospitalisation was 6 days for DVT, 10 days for PE, and 3 days for BC.

Measure of benefits used in the economic analysis
The number of life years saved was used as the measure of benefits.

Direct costs
Direct costs were not discounted given the short time frame of the study (less than 1 year). Quantities and costs were reported separately. Direct costs included costs of thromboprophylactic method, costs of diagnosis and therapy, costs of hospitalisation, and costs of pathophysiological events. Costs from the hospital perspective included costs of medication, laboratory tests, and medical personnel. The quantity/cost boundaries adopted were those of society, the third-party payer, and the hospital. The estimation of quantities and costs was based on actual data. Thromboprophylactic costs were divided into administration and material costs. Administration costs were allocated to the hospital management costs, whereas material costs were considered as net investment in summary calculations. The price year was not reported.

Indirect Costs
Indirect costs were not discounted given the short time frame of the study (less than 1 year). Quantities and costs were reported separately. Indirect costs reflected costs of lost productivity. The estimation of quantities and costs was based on actual data. Costs were derived from a 1995 source. The price year was not reported.
Currency
German marks (DM).

Sensitivity analysis
A one-way sensitivity analysis was carried out on all model parameters.

Estimated benefits used in the economic analysis
The number of expected events were lower under LMWH for each parameter except for an unimportant difference in general surgery for BC. Society would save 130.9 life years in general surgery and 784.35 life years in orthopaedic surgery with LMWH, per 10,000 patients. Sick funds would save 103.3 patients at risk after DVT and 35.9 after PE in general surgery with LMWH, per 10,000 patients. In orthopaedic surgery, 492 patients were at risk after DVT and 223.6 after PE.

Cost results
Society would save 967 production days (DM207,400) in general surgery and 5,308 production days (DM1,138,500) in orthopaedic surgery with LMWH per 10,000 patients. Sick funds would save 1,002 hospitalisation days (DM351,100) in general surgery with LMWH, per 10,000 patients. Sick funds would save 5,520 hospitalisation days (DM1,934,500) in orthopaedic surgery with LMWH, per 10,000 patients. Hospital management would save total costs of DM976,100 in general surgery and DM2,010,300 in orthopaedic surgery with LMWH, per 10,000 patients. In the summary calculation, a cost saving of DM954,600 was achieved in general surgery and DM4,683,300 in orthopaedic surgery with LMWH, per 10,000 patients.

Synthesis of costs and benefits
LMWH avoids pathophysiological events, saves costs and life years in general and orthopaedic surgery from all perspectives. These results were not sensitive to the parameters of the model.

Authors’ conclusions
The use of LMWH as post-operative thromboprophylactic agents is more cost-effective than UFH in Germany.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used namely that it represented currently available post-operative thromboprophylactic agents. You, as a user of this database, should decide if these health technologies are relevant to your setting.

Validity of estimate of measure of benefit
The authors did not state that a systematic review of the literature had been undertaken. More details could have been provided about the search strategy, study selection, design of primary studies, and methods of dealing with differences in effectiveness estimates. Effectiveness estimates were combined using narrative methods. Estimation of benefits was obtained directly from the effectiveness analysis. The benefits do not appear to have been discounted.

Validity of estimate of costs
All categories of cost relevant to the perspectives adopted were included in the analysis. Quantities and costs were reported separately. A sensitivity analysis was conducted on costs and quantities. Charges were not used to proxy prices. The price year was not reported.

Other issues
The authors made appropriate comparisons of their findings with those from other studies, but the issue of generalisability to other settings was not discussed. The study considered patients undergoing general or orthopaedic surgery and this was reflected in the authors' conclusions. The authors reported the following limitations: the incidence of pathophysiological events was based on one published meta-analysis; the value of survived patients at risk, and saved life years were not considered; inclusion of the cost saving for these physiological units would lead to a greater increase in the cost-effectiveness of LMWH in both surgeries.

**Implications of the study**
The authors suggested the conduct of multi-centred, double blind studies of thromboprophylactic use of LMWH versus UFH in combination with a detailed prospective economic evaluation and health care resource utilisation analysis to confirm the direction of the economic results.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
10378995

**DOI**
10.1006/phrs.1999.0479

**Other publications of related interest**


**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Cohort Studies; Cost-Benefit Analysis; Delivery of Health Care /economics; Fibrinolytic Agents /chemistry /economics; General Surgery /economics; Germany; Heparin /chemistry /economics; Humans; Molecular Weight; Orthopedics /economics; Postoperative Care /economics; Retrospective Studies

**AccessionNumber**
Date bibliographic record published
31/03/2001

Date abstract record published
31/03/2001