# Cost effectiveness of desirudin compared with a low molecular weight heparin in the prevention of deep vein thrombosis after total hip replacement

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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

The use of two low molecular weight heparins, desirudin and enoxaparin, as prophylaxis against thromboembolic events following total hip replacement (THR). Desirudin was the intervention under consideration and was administered in 15-mg doses twice daily. Enoxaparin was the comparator and was administered in a single dose of 40 mg/day. Both low molecular weight heparins were given via subcutaneous injection.

## Type of intervention

Primary prevention.

## Economic study type

Cost-effectiveness analysis.

## Study population

A model was constructed using data derived from a clinical trial and an earlier cost-effectiveness study. No detailed information on the study population was given, although in the paper it was reported that the mean age was 67 years and that 42% were male. The paper also stated that the mortality risk was taken from the Swedish population.

## Setting

The setting was secondary care. The economic study was carried out in Sweden.

## Dates to which data relate

The effectiveness evidence was taken from papers published between 1987 and 1997. It was not stated when the trial underlying this paper was undertaken. The price year was 1998.

## Source of effectiveness data

The effectiveness data were derived from a single study.

## Link between effectiveness and cost data

The cost data were calculated completely independently of the effectiveness data.

## Modelling

A probability tree incorporating Markov processes was used to simulate the outcomes for THR replacement from the age of 67 to 85 years. One-year cycles were used. Outcomes from the model were incorporated with costs to estimate the costs per life-year gained (LYG) between the intervention and comparator.


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**Outcomes assessed in the review**
The outcomes assessed were:

the incidence of DVT using enoxaparin,

the incidence of DVT using desirudin,

the probability of detecting DVT,

the probability of death from a detected and treated DVT,

the probability of developing a pulmonary embolism (PE) if a DVT was detected,

the probability of sudden death from a PE,

the probability of detecting a PE,

the probability of death from a detected and treated PE,

the probability of death from a non-detected PE,

the probability of a false-positive diagnosis of a DVT, and

the probability of a false-positive diagnosis of a PE.

**Study designs and other criteria for inclusion in the review**
The effectiveness data were taken from a randomised controlled trial (RCT), a cost-effectiveness study and Swedish population statistics from 1992. No inclusion or exclusion criteria were discussed.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
The criteria were not stated, although the RCT was stated to have been multi-centred and double-blind.

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

**Number of primary studies included**
Three RCTs were included in the review.

**Methods of combining primary studies**
Data were selectively collected from the primary studies.

**Investigation of differences between primary studies**
Not stated.

**Results of the review**


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The incidence of DVT was 25.5% with enoxaparin and 18.4% (95% confidence interval, CI: 15.7 - 21.3) with desirudin.

The probability of detecting a DVT was 16.2%.

The probability of death from a detected and treated DVT was 0.6%.

The probability of developing a PE if a DVT detected was 11.4%.

The probability of sudden death from a PE was 11.0%.

The probability of detecting a PE was 29%.

The probability of death from a detected and treated PE was 8.0%.

The probability of death from a non-detected PE was 30.0%.

The probability of a false-positive diagnosis of a DVT was 4.4%.

The probability of a false-positive diagnosis of a PE was 2.0%.

## Measure of benefits used in the economic analysis

The measure of benefits used in the economic analysis was the LYG. The benefits were discounted at a rate of 5% per annum.

## Direct costs

Discounting was carried out at 5% per annum. The costs considered were for prophylaxis with desirudin, prophylaxis with enoxaparin, and for confirming and treating PE and DVT. The costs were presented as 1998 SEK, from the perspective of the Swedish health care providers.

The costs of long-term hospital stay, diagnostic procedures and treatment for DVT and PE were taken from a cost-effectiveness study published in 1994. The costs of long-term complications resulting from DVT development were for superficial thrombophlebitis, recurrent DVT, erysipelas, venous leg ulcer, varicose veins requiring medical attention, venous eczema, venous insufficiency and PE. These costs were taken from a paper from 1997, which outlined the annual incremental costs associated with long-term complications arising from DVT development. The costs of administering enoxaparin and desirudin were not given.

## Statistical analysis of costs

No statistical analysis of the costs was carried out.

## Indirect Costs

The indirect costs were not considered. However, given the age profile of the patients considered in the study, the inclusion of the indirect costs associated with lost productivity would probably have been inappropriate.

## Currency

Swedish kroner (SEK).

## Sensitivity analysis

One-way sensitivity analyses were carried out on the efficacy of desirudin (between the values of the 95% CI), the exclusion of the long-term costs, the inclusion of only proximal DVT, and the discount rate.


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### Estimated benefits used in the economic analysis
The incremental benefit of using desirudin in place of enoxaparin, estimated at baseline, was 1.91 additional life-years per 100 patients. The model simulated a period of 18 years from the time the prophylaxis was given.

### Cost results
The average, total thrombosis-related cost per patient was SEK 7,022 with enoxaparin versus SEK 7,497 with desirudin, a 7% difference. This was with the costs discounted at 5% per annum over an 18-year period. The costs of adverse effects were not considered.

### Synthesis of costs and benefits
The incremental cost per LYG using desirudin over enoxaparin was SEK 24,864. This result was sensitive to the efficacy of desirudin, rising to SEK 108,000 per LYG when the lower 95% CI for efficacy was considered. It was also sensitive to the exclusion of long-term costs (SEK 103,000 per LYG) and to the assumption that only a reduction in proximal DVT would reduce post-thrombotic syndrome (SEK 60,000).

In the worst-case scenario, the cost per LYG was SEK 108,326. In the best-case scenario, the use of desirudin was cost-saving.

### Authors' conclusions
A dose of 15 mg desirudin, administered twice daily as a prophylaxis against deep vein thrombosis (DVT) development in total hip replacement (THR) patients, is a more efficacious and cost-effective alternative to a single 40 mg/day dose of enoxaparin.

### CRD COMMENTARY - Selection of comparators
The low molecular weight heparin enoxaparin is the standard prophylaxis against DVT development in Swedish orthopaedic patients. It was therefore a suitable comparator for desirudin.

### Validity of estimate of measure of effectiveness
The authors did not state that a systematic review of the literature had been undertaken. The authors used effectiveness data from one clinical trial, although it must be stated that this was a large, multi-centre double-blinded RCT. The authors did not consider the impact of the differences of other studies, although the other studies reported efficacy rates for desirudin that were covered by the sensitivity analysis around the 95% CI of the chosen trial.

### Validity of estimate of measure of benefit
The estimation of benefits was modelled using a decision tree with Markov processes. The authors acknowledged that this is an appropriate way to simulate the long-term benefits and improvements when only small changes in efficacy are seen.

### Validity of estimate of costs
The indirect costs were not included, but they would not have been relevant for this study. Therefore, all the categories of cost relevant to the perspective adopted were included in the analysis. The costs and the quantities were reported separately. The costs were appropriately discounted and the price year was given.

### Other issues
The authors compared the cost-effectiveness of desirudin to interventions for the treatment of different medical conditions, but not with other studies looking at the cost-effectiveness of other prophylactic regimens. The issue of the


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generalisability to health care providers elsewhere was not addressed. The results were not presented selectively. The authors acknowledged that the results were only sensitive to letting proximal DVTs progress to future thromboembolic events, rising to SEK 108,000 per LYG.

### Implications of the study

The authors suggest that further work is required to identify the exact role for desirudin in orthopaedic practice. They suggest that orthopaedic departments should consider the cost-effectiveness of desirudin as thromboprophylaxis in elective THR.

### Source of funding

None stated.

### Bibliographic details

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