Antithrombotic strategy after total hip replacement: a cost-effectiveness analysis comparing prolonged oral anticoagulants with screening for deep vein thrombosis

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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
Prolonged oral anticoagulant therapy was compared with screening in the prevention of deep vein thrombosis (DVT) after total hip replacement.

Type of intervention
Secondary prevention and screening.

Economic study type
Cost-effectiveness analysis.

Study population
Patients undergoing total hip replacement.

Setting
Hospital. The economic study was conducted in Geneva, Switzerland.

Dates to which data relate
Effectiveness data were collected from studies published between 1966 and 1995. The dates related to the resource use were not explicitly specified. The fiscal year was 1994.

Source of effectiveness data
Effectiveness data were derived from a synthesis of previously completed studies and assumptions made by the authors.

Modelling
A D Marker 7.015 decision analysis program was used to create a model which represented the different options available before hospital discharge for patients undergoing hip replacement and at risk of developing DVT. A Markov model was used to estimate the costs and benefits associated with each strategy.

Outcomes assessed in the review
The following outcomes were assessed: Incidence of DVT at hospital discharge, sensitivity and specificity of US and venography, number of cases of recurrent DVT and pulmonary embolism (PE), number of major bleeding complications and treatment efficacy in preventing recurrent DVT.

Study designs and other criteria for inclusion in the review
Not stated.

**Sources searched to identify primary studies**
A Medline search was performed, for studies on DVT published between 1966 and 1995.

**Criteria used to ensure the validity of primary studies**
Not stated.

**Methods used to judge relevance and validity, and for extracting data**
Estimates derived from the literature were tested in sensitivity analyses.

**Number of primary studies included**
In total, 20 studies were directly used as the references for the values adopted by the authors.

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

**Results of the review**
The baseline values (% and ranges used in sensitivity analyses in parentheses) were:

- 20 (15 - 25) for incidence of DVT at hospital discharge,
- 20 (20 - 50) for pulmonary embolism if recurrent DVT,
- 0.125 (0.05 - 0.25) for major haemorrhage and
- 70 (60 - 80) for treatment efficacy in preventing recurrent DVT.

The sensitivity of US in proximal and distal DVT was 62% (range: 54 - 70) and 48% (range: 29 - 67), respectively. The specificity of US in both DVTs was 96% (range: 96 - 98). The sensitivity and specificity of venography was 100%.

**Methods used to derive estimates of effectiveness**
Assumptions were also made by the authors.

**Estimates of effectiveness and key assumptions**
A set of 7 assumptions, mostly regarding the risk of developing recurrent DVT and long-term morbidity from DVT, were made in formulating the model.

**Measure of benefits used in the economic analysis**
The number of additional pulmonary embolisms (PE) averted and number of additional bleeding episodes induced relative to the no screening, no prophylaxis strategy were calculated for a cohort of 10,000 patients over a three-month period following hip replacement. The final benefit measure was the number of additional PEs averted minus the number of additional bleeds induced.

**Direct costs**
Discounting of costs was not required due to the 3-month time frame of the study. Quantities were not fully reported separately from the costs, but cost items were reported separately. Direct health service costs were considered with all costs being calculated from the perspective of the health care system. The cost analysis covered the variable costs of prophylactic oral anticoagulant therapy, diagnosis of DVT and PE, management of DVT, management of PE, and management of bleeding. The source of cost data was the study institution's clinical cost manager. The fiscal year was 1994.

**Indirect Costs**
Not considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
1 and 2-way sensitivity analyses were performed on all parameters in the model and threshold analysis was performed on the most sensitive parameters.

**Estimated benefits used in the economic analysis**
The number of additional PEs averted (relative to the comparator for a cohort of 10,000 patients over 3 months) were 135 for anticoagulant therapy for 6 weeks, 170 for anticoagulant therapy for 12 weeks, 92 for ultrasound screening and 134 for venography screening. The number of additional bleed induced were 71, 140, 13, and 19, respectively.

**Cost results**
The total costs for a cohort of 10,000 patients over 3 months were $4,922,778, $4,921,278, $6,979,656, $5,328,344, and $9,155,161, respectively, for no prophylaxis, anticoagulant therapy for 6 weeks, anticoagulant therapy for 12 weeks, ultrasound screening, and venography screening.

**Synthesis of costs and benefits**
Costs and benefits were combined by calculating the incremental cost per additional PE averted. Compared with stopping prophylaxis at the time of hospital discharge, a 6-week course of prophylactic oral anticoagulant therapy was the dominant strategy. Compared with stopping prophylaxis at discharge and a 6-week course of prophylactic oral anticoagulant therapy, US screening had an incremental cost-effectiveness ratios of $5,267 and $27,137, respectively. Venography screening would be the most effective strategy, but its marginal costs per additional PE averted would exceed $80,000, compared with US screening. The most sensitive parameters of the model were incidence of bleeding, sensitivity of US in detecting proximal DVT, and incidence of DVT at discharge.

**Authors’ conclusions**
After hip replacement with conventional perioperative antithrombotic prophylaxis, oral anticoagulation administered for 6 weeks is effective in preventing DVT and symptomatic PE, unless the bleeding risk is very high. Moreover, this strategy is less costly compared with stopping antithrombotic prophylaxis at the time of hospital discharge. Alternatively, ultrasound screening is also effective, minimises the risk of bleeding, and has a low marginal cost-effectiveness ratio.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the choice of the comparator. It was regarded as the standard of care in the context in question. You, as a database user, should consider whether this is a widely used health technology in your own setting.
Validity of estimate of measure of benefit
The internal validity of the estimates of measure of benefit can not be fully assessed due to the lack of information provided regarding the quality and designs of the primary studies included in the review.

Validity of estimate of costs
Quantities were not fully reported separately from the costs. However, adequate details of methods of cost estimation were given. The study lacked a prospective cost analysis.

Other issues
It was noted that the conclusions of this study may be generalisable to other types of major orthopaedic surgery, such as total knee replacement.

Source of funding
None stated.

Bibliographic details

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Other publications of related interest
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