Cost comparison of at-home treatment of deep venous thrombosis with low molecular weight heparin to inpatient treatment with unfractionated heparin

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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 treatment of uncomplicated deep venous thrombosis (DVT) at-home using low molecular weight heparin (LMWH) was compared with inpatient treatment using unfractionated heparin (UFH). As part of the at-home treatment, nursing staff from the outreach “Interface” programme were responsible for conducting home nurse visits to administer the drug (if the patient was unwilling to self-inject), review the patient, and to collect blood daily for measurement of the international normalised ratio (INR). The study protocol also required that general practitioners (GPs) assessed their patients on a daily basis. In addition, hospital medical staff provided a 24-hour back-up. The participants in the study also needed an at-home carer.

The LMWH used was enoxaparin sodium, which was administered twice daily subcutaneously at a dosage of 1 mg/kg. Warfarin therapy was also administered concurrently with the LMWH. The duration of this combined therapy was 5 days, or until the INR was stable at 2.0.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with a principal diagnosis of uncomplicated DVT, without a prior occurrence of this condition and without co-existing morbidities.

Setting
The setting was secondary care. The economic study was carried out at the Queen Elizabeth Hospital, Adelaide, Australia.

Dates to which data relate
The effectiveness data were gathered from 1997 to 1999. The resource use data for the treatment group also related to this time period. The resources used by the control group related to 1994 to 1997. The price year was not reported.

Source of effectiveness data
The effectiveness data were obtained from a single study.

Link between effectiveness and cost data
For the treatment group, the costing was conducted prospectively on the same patient sample as that used in the
effectiveness analysis. However, for the control group, the costing was conducted retrospectively on patients matched to those in the treatment group.

**Study sample**
The participants were recruited from those presenting with a principal diagnosis of uncomplicated DVT at the Queen Elizabeth Hospital between 1997 and 1999. The diagnosis of DVT was confirmed by duplex ultrasound or venography. Patients were not eligible for inclusion in the study if they had had an episode of DVT or pulmonary embolism (PE), concurrent symptomatic PE or clinical suspicion of PE, currently active bleeding or peptic ulcer disease, familial bleeding disorders, malignant hypertension, hepatic failure or renal failure. They were also excluded if they had a history of heparin-associated thrombocytopenia, had significant co-existing morbidity such as cancer, severe infection, stroke, or other conditions associated with life expectancy under 6 months. Further exclusion criteria were a geographic inaccessibility for suitable surveillance at home, the presence of known deficiency of protein C, S or antithrombin 3, pregnancy, a baseline INR greater than 1.4, a platelet count of less than 50,000, a lower limb in plaster, or allergy to heparin, bisulfites or fish. In addition to satisfying these exclusion criteria, the patients selected for the control group were matched with those in the treatment group on the basis of age, at least the same level of co-morbidity and the anticipation of similar clinical outcomes.

Twenty-eight patients were chosen to receive at-home treatment. Matches for each of these patients were found in the control group. All but two of the participants in the treatment group were discharged home from the emergency department. These two patients were admitted to the hospital for an assessment of co-morbidities.

**Study design**
The study was a single-centred, prospective non-randomised study, using historical controls, which was carried out in a single centre. The duration of follow-up was the treatment period, which could be 5 days or until the INR was consistently equal to 2. Throughout the treatment period, data on the costs were collected on a daily basis by Interface staff. At the end of the treatment period, a questionnaire was administered to obtain information on the costs to the Federal Health System, the costs incurred by the patients, the transport costs associated with follow-up, and days off work for the carers. Six participants were lost to follow-up. The staff who matched the participants in the two groups were blinded to the cost and length of stay.

**Analysis of effectiveness**
The basis of the analysis was intention to treat. No primary health outcomes were used in the analysis. However, data on patient satisfaction were collected using a questionnaire administered after completion of the treatment. The comparability of the baseline characteristics of the treatment and control groups was assessed.

**Effectiveness results**
According to the patient satisfaction questionnaire, 77% of the patients rated at-home treatment as excellent while the remainder (23%) ranked it as adequate. No data were provided on the patient satisfaction experienced in the control group.

**Clinical conclusions**
The authors assumed that the clinical outcomes from at-home and hospital treatment of DVT would be similar. Hence, a cost-minimisation analysis was conducted.

**Measure of benefits used in the economic analysis**
The economic analysis was based on differences in the costs only since the authors assumed that there were no differences in the benefits of at-home and inpatient treatment of DVT.
Direct costs
The costs and the quantities of resources were not reported separately. The direct costs measured were for enoxaparin and the hospital. The hospital costs included attendance at the emergency department, pathology and radiology, and an estimate of Interface administration cost. The direct costs for the control group were estimated using a clinical costing software programme. Both the estimates for the treatment and control groups were derived from actual data. The resources for the treatment group were measured between 1997 and 1999, while those for the control group were measured from 1994 to 1997. The costs of the resources used by this group were adjusted for inflation (using the consumer price index), although no price year was stated. Discounting was not performed since the time horizon was less than two years.

Statistical analysis of costs
The mean costs and the standard error of the mean (SEM) were reported. No statistical analysis of the costs was undertaken.

Indirect Costs
The costs and the quantities of resources used were not analysed separately. The indirect costs included costs borne by Medicare, patients and their carers, and also transport costs. These costs were derived using actual data obtained from patients from 1997 to 1999. It was unclear whether comparable data were collated for the control group. The costs were not discounted.

Currency
Australian dollars (Aus$).

Sensitivity analysis
No sensitivity analysis was undertaken.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
The mean total cost of at-home treatment of DVT with LMWH was Aus$756 (SEM=76) per patient.

The mean total cost of inpatient treatment with UFH was Aus$2,208 (SEM=146) per patient.

Synthesis of costs and benefits
Not applicable.

Authors’ conclusions
Compared to standard inpatient treatment with unfractionated heparin (UFH), treatment at home with enoxaparin (a low molecular weight heparin, LMWH) was less expensive and resulted in relatively little cost shifting to patients, carers and Medicare. It also yielded high levels of patient satisfaction.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used. Inpatient treatment with UFH was the standard course of therapy for DVT prior to the introduction of at-home treatment with enoxaparin. You should decide if this is a widely used health technology in other settings.
Validity of estimate of measure of effectiveness
No measure of effectiveness was used. The authors assumed that the effectiveness of at-home and inpatient treatments of DVT would be similar. Some justification was provided to support this assumption. However, there is evidence to suggest that LMWH is associated with fewer side effects and complications than UFH (see Other Publications of Related Interest). Thus, by omitting such indirect consequences, the authors may have underestimated the cost-effectiveness of LMWH.

Validity of estimate of measure of benefit
No summary measure of benefit was used.

Validity of estimate of costs
The authors reported that the costs of the treatment group were estimated from a societal perspective, but it was unclear whether this perspective was also adopted when estimating the costs for the control group. The impact of any consequent omission on the results is unclear. For example, there was no productivity loss reported by the carers of those in the treatment group, and this may well also be the case for those in the control group. In addition, following the completion of the study, the dosing regimen for enoxaparin has subsequently changed from 1 mg/kg twice daily to 1.5 mg/kg once daily. This implies that the costs of the treatment reported in the study may overestimate the actual costs of the new treatment regimen. A sensitivity analysis of the quantities was not conducted and this may limit the interpretation of the study findings.

Other issues
The authors did not explicitly make appropriate comparisons of their findings with those from other studies. The authors examined the costs of extending the at-home programme from one hospital to the entire region of South Australia. However, as the authors acknowledged, this attempt to generalise the results may be limited by the availability of such programmes. The generalisability of the results is restricted further by the small sample sizes used in the study. The authors identified the small sample size with the problems of implementing evidence-based practice. The authors cited further limitations to their study. These included the use of historical controls, the lack of data on those lost to follow-up, deviations from the study protocol, and a selection bias between those chosen to participate and non-participants.

Implications of the study
The authors identified a number of potential barriers to the extension of at-home treatment programmes, such as continuous staff turnover. Consequently, the authors recommended greater investment to increase awareness of such evidence-based practice.

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Bibliographic details

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Other publications of related interest
Dolovich LR, et al. A meta-analysis comparing low-molecular weight heparins with unfractionated heparin in the

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