Cost-saving approach to patients on long-term anticoagulation who need endoscopy: a
decision analysis

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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
Three management strategies for anticoagulation in patients undergoing an urgent or elective endoscopy were considered. The first was an initial diagnostic endoscopy without altering anticoagulation therapy, followed by therapeutic endoscopy if required. The second option was termed the "heparin window approach". This involved stopping warfarin, starting intravenous heparin whilst the patient is in hospital, undertaking endoscopy during a "heparin window", and restarting warfarin after the procedure. The third option was a "switch to low molecular weight heparin (LMWH)". This required the administration of LMWH whilst stopping warfarin for 5 days, holding the afternoon dose of LMWH on the day before the procedure, undertaking endoscopy, and restarting LMWH for 5 days.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients on long-term anticoagulation therapy who required an urgent or elective endoscopy.

Setting
The setting was unclear, but it was likely to have been secondary care or tertiary care. The study was conducted in the USA.

Dates to which data relate
The clinical effectiveness data and resource use information were taken from a study published in 2000. The price year was not reported.

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

Link between effectiveness and cost data
The resource use data were derived from data collected in the same study that provided the clinical effectiveness information.

Study sample
The study sample contained 64 patients, but the number of patients who received each management option was not stated. No sample size or power calculations were reported. Details of how the sample was selected or how it compared with the study population were not provided.

**Study design**
The study that provided the clinical effectiveness evidence was a retrospective cohort study. It would appear that patients were followed up for the duration of their hospital stay. The authors did not report whether any patients were lost to follow-up, or whether the study was conducted in single or multiple centres.

**Analysis of effectiveness**
The primary health outcome used in the analysis was the length of hospital stay. Since no details of the different patient groups were provided, it is not possible to comment on whether the groups were comparable at baseline.

**Effectiveness results**
In the cohort of 64 patients, 211 additional days were spent waiting for anticoagulation to be finalised after the procedure, resulting in an average of 3.3 days per patient. For patients for whom a therapeutic intervention was predicted, this increased to an average of 3.77 days per patient. A direct therapeutic impact was made in 35% of the patients.

**Clinical conclusions**
The authors did not draw any conclusions from the clinical data presented in this paper.

**Modelling**
A decision analysis model was used to extend the results of the clinical study.

**Measure of benefits used in the economic analysis**
No summary measure of health benefits was used in the economic analysis. The study was, in effect, a cost-consequences analysis.

**Direct costs**
The direct costs of the hospital were included in this study. The cost of performing an endoscopy and the cost of a hospital stay were identified. However, the costs of drugs and outpatient care were not included in the analysis. The resource use data were taken from the model that extended the results of the cohort study. The cost data were taken from the hospital charges. Hospital stay charges and endoscopy charges were reported, but resource use was unclear. It was assumed that the costs were 70% of the hospital charges. The study assumed that the costs of the initial endoscopy were the same irrespective of the anticoagulation strategy used. The costs were not discounted, but this was appropriate since they were incurred during less than one year.

**Statistical analysis of costs**
The cost data were treated deterministically.

**Indirect Costs**
No indirect costs were included in this analysis.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity and threshold analyses were undertaken to assess the impact of variability in the data. The paper did not report the source of the ranges used.

**Estimated benefits used in the economic analysis**
Not relevant as no measure of health benefits was used in the economic analysis.

**Cost results**
The total costs for patients undergoing an urgent or elective endoscopy were:

for the "heparin window approach", $330,164 per 100 patients;

for an initial diagnostic endoscopy followed by a therapeutic endoscopy if required, $245,157 per 100 patients.

The total costs for patients undergoing an elective endoscopy were:

for the "heparin window approach", $389,216 per 100 patients;

for the LMWH strategy, $176,780 per 100 patients;

for an initial diagnostic endoscopy followed by a therapeutic endoscopy with the LMWH strategy, $161,420 per 100 patients;

for an initial diagnostic endoscopy followed by a therapeutic endoscopy with the "heparin window approach", $202,730 per 100 patients.

**Synthesis of costs and benefits**
The costs and benefits were not synthesised as no measure of health benefits was used.

In patients undergoing an urgent or elective endoscopy, the threshold analysis showed that diagnostic endoscopy on anticoagulation was preferable as long as the expected chances of therapeutic intervention were less than 61%. The sensitivity analysis showed that the total cost was sensitive to changes in the hospital costs.

In patients undergoing elective endoscopy, the threshold analysis showed that initial diagnostic endoscopy on anticoagulation followed by the "switch to LMWH" strategy was cost-saving compared with the "direct switch to LMWH", providing the expected chances of therapeutic intervention were less than 26%. Diagnostic endoscopy followed by the "switch to LMWH" approach was preferable to the standard approach. A "direct switch to LMWH" approach was cost-saving in comparison with diagnostic endoscopy followed by the "heparin window" approach as long as the frequency of repeat procedures was greater than 10%. When the heparin window strategy was involved, the total cost was very sensitive and increased with the cost of the hospital stay.

**Authors' conclusions**
Based on clinical and economic evidence, the most appropriate strategy was performing an initial diagnostic endoscopy without altering anticoagulation therapy, followed by a therapeutic endoscopy if required.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the comparators used. They were commonly used management approaches in patients undergoing an urgent or elective endoscopy. You should consider how the two options considered relate to current...
practice in your own setting before applying the results of this paper.

**Validity of estimate of measure of effectiveness**
The information on clinical effectiveness was derived from a retrospective cohort study. Whilst this is an acceptable study design it includes a number of inherent biases. A randomised controlled trial would have provided a more robust assessment of the clinical implications of the three strategies considered. The paper lacked any information on the characteristics of the patient sample and their treatment group, thus it is not possible to comment on how the patient sample represented the study population. The paper did not report whether the patient groups were comparable at baseline, or details of the analysis of the results. The results of the clinical study were extended to a larger sample of patients using a decision tree model.

**Validity of estimate of measure of benefit**
No measure of health benefit was used in the economic analysis. This study was, in effect, a cost-consequences study.

**Validity of estimate of costs**
The authors stated that a hospital perspective was used in the study. However, it appears that only hospital stay and procedural costs have been considered, as an assessment of the drug and outpatient costs was not reported. This has the potential to bias the economic results of this study. It was also assumed that the cost of the initial endoscopy was the same irrespective of the strategy adopted. However, one group underwent a diagnostic endoscopy without a change to their anticoagulation therapy, followed by a therapeutic endoscopy if required. This is likely to lower the cost of the initial endoscopy as no interventions were being undertaken. The paper provided a breakdown of the unit costs of hospital stay and endoscopies, which increases the generalisability of the study findings, but no clear resource use information was reported, which detracts from the generalisability of the paper. A sensitivity analysis was undertaken to assess variability in the data, and this adds to the generalisability of the study findings. Although charges were used to identify the economic implications of the three strategies, they were adjusted to reflect actual costs. Since a price year was not reported, this will prevent future reflation exercises and reduce the generalisability of the study findings.

**Other issues**
The authors compared their findings with one other similar study, but did not directly consider how their results could be generalised to other settings. The authors' conclusions reflected their analysis. The authors acknowledged that their decision model was simple and, if they had access to more sophisticated software, they would have been able to produce a more accurate estimate of clinical and economic effectiveness. They also criticised their work for using charges to proxy costs.

**Implications of the study**
The authors did not make any direct recommendations for further research or changes to practice.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
12907331

**DOI**
Indexing Status
Subject indexing assigned by NLM

MeSH
Anticoagulants /adverse effects /therapeutic use; Cost Savings; Cost-Benefit Analysis; Decision Support Techniques; Endoscopy /adverse effects /economics; Gastrointestinal Hemorrhage /chemically induced /etiology /prevention & control; Humans; Retrospective Studies

AccessionNumber
22003001136

Date bibliographic record published
30/04/2005

Date abstract record published
30/04/2005