Pharmacist-provided anticoagulation management in United States hospitals: death rates, length of stay, Medicare charges, bleeding complications, and transfusions
Bond C A, Raehl C L

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 study examined pharmacist-managed anticoagulation treatment with heparin and warfarin.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised Medicare inpatients with an International Classification of Diseases code diagnosis (ICD-9) indicating the need for anticoagulation (thrombosis, thrombophlebitis, hip replacement, atrial fibrillation, acute coronary syndrome, heart value replacement and bleeding complications).

Setting
The setting was secondary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness and resource use data related to 1995. The price year was 1995.

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

Link between effectiveness and cost data
The cost data were derived from the same patient sample that provided the clinical effectiveness data.

Study sample
Data for hospitals with pharmacist-provided heparin and warfarin management were identified using the 1995 National Clinical Pharmacy Services Database. A questionnaire was sent to a total of 3,701 hospitals, of which 1,109 responded (30% response rate). Of the respondents, 211 (19%) had a pharmacist-managed heparin programme and 122 (11%) had a pharmacist-managed warfarin programme. Nine hundred and fifty-five of the responding hospitals (86%) had at least one Medicare patient with a diagnosis indicating the need for anticoagulation. In total, these 955 hospitals had 717,396 Medicare patients with a diagnosis indicating a requirement for anticoagulation. No sample size or power calculations were reported in this paper.
Study design

This was a multi-centred cross-sectional study. The duration of follow-up was the length of hospital stay. The retrospective nature of the study design meant that there was no loss to follow-up.

Analysis of effectiveness

The primary health outcomes used in this analysis were:

- the proportion of deaths;
- the length of hospital stay;
- the proportion of patients with bleeding complications;
- the proportion of patients receiving blood transfusions; and
- the mean number of units of blood transfused per patient.

No comparisons were made between the patient samples from the hospitals with and without pharmacist-managed anticoagulation programmes.

Effectiveness results

The proportion of deaths was 6.37% in hospitals with a pharmacist-managed heparin programme and 7.19% in hospitals without this service, (p<0.0001).

The mean length of stay was 7.79 days (standard deviation, SD=9.41) in hospitals with a pharmacist-managed heparin programme versus 8.66 days (SD=11.17) in hospitals without this service, (p<0.0001).

A total of 8.84% of patients in hospitals with a pharmacist-managed heparin service experienced bleeding complications, compared with 9.12% in hospitals without such a service, (p<0.0009).

In hospitals with a pharmacist-managed heparin service, 13.82% of patients received a blood transfusion with a mean of 4.68 units (SD=7.77) being given, while in hospitals without such a service, 14.99% of patients received a mean of 5.90 units of blood (SD=22.40), (p<0.0001).

The proportion of deaths was 6.66% in hospitals with a pharmacist-managed warfarin programme and 7.10% in hospitals without this service, (p<0.0001).

The mean length of stay was 8.04 days (SD=9.60) in hospitals with a pharmacist-managed warfarin programme versus 8.54 days (SD=10.98) in hospitals without this service, (p<0.0001).

A total of 8.41% of patients in hospitals with a pharmacist-managed warfarin service experienced bleeding complications, compared with 9.15% in other hospitals, (p<0.0001).

In hospitals with a pharmacist-managed warfarin service 11.72% of patients received a blood transfusion with a mean of 4.89 units (SD=8.11) being given, while in hospitals without such a service, 15.12% of patients received a mean of 5.75 units of blood (SD=21.40), (p not significant).

Clinical conclusions

The authors concluded that hospitals with pharmacist-managed anticoagulation programmes had better clinical outcomes than hospitals without such programmes.

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

**Direct costs**
The costs of the health care payer were included in the analysis. The costs of each hospital stay included in the study were taken from the actual Medicare charges for that stay. These were obtained from the Expanded Modified Medicare Provider Analysis and Review. The resource use was measured in 1995 and the price year was 1995. The costs were not discounted as they were incurred during less than one year.

**Statistical analysis of costs**
The difference between the mean costs of the patients groups was tested using the Mann-Whitney test.

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

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was undertaken.

**Estimated benefits used in the economic analysis**
Not relevant.

**Cost results**
The mean cost of treating patients in a hospital with a pharmacist-managed heparin programme was $16,216 (SD=24,258), compared with $17,361 (SD=26,172) in hospitals without this service, (p<0.0001).

The mean cost of treating patients in a hospital with a pharmacist-managed warfarin programme was $16,797 (SD=26,119), compared with $17,167 (SD=25,746) in hospitals without this service, (p<0.0001).

**Synthesis of costs and benefits**
The health benefits and costs were not combined in this study.

**Authors’ conclusions**
Pharmacist-managed anticoagulation programmes result in better clinical outcomes and lower costs.

**CRD COMMENTARY - Selection of comparators**
This study compared hospitals with pharmacist-managed anticoagulation (heparin or warfarin) programmes with hospitals without such programmes. A hospital could have either one of these services, both services, or neither service. You should consider how these relate to your own setting before applying the findings of this study.

**Validity of estimate of measure of effectiveness**
The clinical effectiveness data used in this study were taken from a retrospective cross-sectional study. Whilst this study
was appropriate for the stated hypothesis, there were a number of aspects of the study that threatened the validity of the results. The response rate to the questionnaire used to collect the data was very low (30%), and the authors did not consider whether the characteristics of the hospitals and their patient populations differed between those that responded and those that did not. This means that the extent of selection bias in the study sample was not assessed. In addition, it was unclear whether the study sample was representative of the study population, and there was no assessment of whether the patient populations at hospitals with and without pharmacist-managed anticoagulation services were comparable. This means that it was not possible to identify whether there were any potential confounding factors that might have impacted on the study results. Despite the limitations in the retrospective observational nature of the study design, the effectiveness results obtained appear to have been similar to those of other studies in the same field.

**Validity of estimate of measure of benefit**
The authors did not use a summary measure of health benefit in their economic analysis. The reader is referred to the comments in the 'Validity of the estimate of measure of effectiveness' field (above).

**Validity of estimate of costs**
The paper did not explicitly state the perspective of the economic study, but it appears to have been that a health care payer. All the relevant costs from this perspective appear to have been included in the analysis. The study obtained total costs for each hospital stay from a central database of Medicare charges. Consequently, no breakdown of resource use and the unit costs was presented in the paper. This limits the scope for applying the results of this study to other settings. The difference between the mean total costs of the patient groups was tested using an appropriate statistical test. This adds to the validity of the cost data. A clear price year was reported, which will allow future reflation exercises, although it was unclear why the authors chose not to convert their 1995 costs to 2004 costs.

**Other issues**
The authors presented their results in a comprehensive manner and their conclusions reflected the scope of their analysis. They compared their results with those from similar studies and reported that their work confirmed the findings of such studies. The study sought to be representative of the position in the USA, but the paper did not consider how the findings might be generalised to other countries. The authors reported that their study was limited by the fact that, since the data for this study were collected in 1995, low molecular weight heparins have become widely used and this might have altered the effectiveness of anticoagulation services.

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

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None stated.

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