Patient costs in anticoagulation management: a comparison of primary and secondary care

David Parry, Stirling Bryan, Kirsten Gee, Ellen Murray and David Fitzmaurice

SUMMARY

Background: *The demand for anticoagulation management is increasing. This has led to care being provided in non-hospital settings. While clinical studies have similarly demonstrated good clinical care in these settings, it is still unclear as to which alternative is the most efficient.*

Aim: *To determine the costs borne by patients when attending an anticoagulation management clinic in either primary or secondary care and to use this information to consider the cost-effectiveness of anticoagulation management in primary and secondary care, both from the National Health Service and patient perspectives.*

Design of study: *Observational study comparing two cohorts of patients currently attending anticoagulation management clinics.*

Setting: *Four primary care clinics in Birmingham and one in Warwickshire, and the haematology clinics at the University of Birmingham Hospitals Trust and the City Hospital NHS Trust.*

Method: *The survey of patients attending the clinics was used to ascertain patient costs. This information was then used in conjunction with the findings of a recent randomised controlled trial to establish cost-effectiveness.*

Results: *Patient costs were lower in primary care than in secondary care settings; the mean (standard deviation) costs per visit were £6.78 (£5.04) versus £14.58 (£9.08). While a previous cost-effectiveness analysis from a health sector perspective alone found a higher cost for primary care, the adoption of the societal perspective lead to a marked change in the result: a similar total cost per patient in both sectors.*

Conclusion: *There are significantly higher costs borne by patients attending secondary care anticoagulation management clinics than similar patients attending primary care clinics. This study also demonstrates that the perspective adopted in an economic evaluation can influence the final result.*

Keywords: *cost-effectiveness analysis; anticoagulation, warfarin, primary care, secondary care.*

D Parry, MA, MSc, lecturer; S Bryan, BSc, MSc, PhD, senior lecturer, Health Economics Facility; K Gee, RGN, BNurs, research associate; E Murray, RGN, MSc, MRC research fellow; and D Fitzmaurice, MD, MRCGP, senior lecturer, Department of General Practice & Primary Care, University of Birmingham.

Address for correspondence

Dr Stirling Bryan, Health Economics Facility, Health Services Management Centre, Park House, Edgbaston Park Road, Birmingham B15 2RT.

Submitted: 15 June 2000; Editor's response: 16 January 2001; final acceptance: 23 July 2001.

Introduction

THE expansion of clinical indications for warfarin (notably for non-rheumatic atrial fibrillation) has led to an increase in the number of patients suitable for warfarin therapy. Warfarin is currently underprescribed for atrial fibrillation[1,2] and the number of patients receiving warfarin continues to rise exponentially.[3] One important consequence of this rising demand is the increased pressure now being placed on the existing, largely hospital-based, service provision.[4] In response, various efforts have been made to provide care in non-hospital settings, both in general practice and in the patient's own home.[5,6] While recent research has shown that the different models of care offer similar control of patients' anticoagulation regimes, little consideration has thus far been given to questions of efficiency.[7] Therefore, the full costs borne by both the health service and patients in alternative settings remain unclear.

Patients frequently incur out-of-pocket expenses when using health care services, most notably in terms of expenditures on travel to and from the clinic or hospital. However, most economic evaluations fail to take into consideration these sometimes substantial costs. The costs considered in an economic evaluation can be divided into three categories:

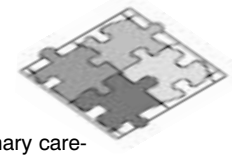
1. National Health Service (NHS)/provider costs — to include the costs of staff time, consumables, investigations, and accommodation;
2. patient/family costs (also referred to in the medical literature as private costs) — to include the travel, time, and medication costs of the patient and, if significant, the patient's family; and
3. other costs — to include the costs incurred in other sectors of the economy as a result of the health care intervention, such as social services or the voluntary sector.

Most evaluations use the costs in Category 1 alone and conduct an evaluation from the NHS perspective; yet, guidance on good practice in economic evaluation suggests that all evaluations should be conducted using the societal perspective in the first instance.[8,9] This involves considering category 1, 2, and 3 costs together. Previous studies which have adopted the societal perspective have demonstrated that patient costs — and, more rarely, other costs — are not negligible.[10,11]

This paper addresses two related questions:

1. How different are the costs incurred by patients receiving anticoagulation therapy in a traditional hospital

HOW THIS FITS IN



What do we know?

Antiocoagulation management is increasingly being provided in primary care-based clinics. Such clinics can provide care of a similar quality to hospital-based services. The overall cost picture, when health sector and patient costs are considered, is unclear.

What does this paper add?

Patient costs associated with attendance at anticoagulation clinics are higher where clinics are hospital-based. Estimates of total annual clinic costs are highly sensitive to the number of clinic visits per patient per year. The results of cost analyses can be strongly influenced by the breadth of the perspective adopted.

setting compared with a general practice setting?

2. If there are setting-specific differences in patient costs, does the adoption of a broader perspective, including patient costs, lead to a different efficiency conclusion when compared with a narrower NHS perspective?

Multi-centre and local ethical approval was obtained for the study.

Method

The costs incurred by patients (and companions) when attending an anticoagulation management clinic were assessed. The research design was an observational study comparing two cohorts of patients currently attending anticoagulation clinics (i.e. patients attending for the first time were excluded from the sample, since the focus for the research was on *recurring* costs). In both primary and secondary care, all consecutively attending patients were invited to take part in the study and those that agreed were recruited. The secondary care sites at which patients were recruited were the Haematology Clinic at the University of Birmingham Hospitals Trust (UBHT) and the Haematology Clinic at the City Hospital NHS Trust (CH). Patients receiving anticoagulation management in primary care were recruited from four primary care clinics in Birmingham and one in Warwickshire. These were practices which participated in an earlier clinical study conducted by the authors[7] and which were still running anticoagulation clinics.

The questionnaire was piloted in one of the hospital sites (CH). The pilot and main surveys were conducted using a self-completion questionnaire, with a researcher/nurse available to provide assistance if required. All patients were assured that their individual responses would be treated as confidential. For patients unable to complete the questionnaire owing to reading or other difficulties, the researcher administered the questionnaire as a face-to-face interview. The survey was carried out in the spring of 1999.

Data were collected on the three main categories of cost shown in previous research to be incurred by patients when consuming health care: transportation costs, time costs (travelling time and time in clinic) and other self-reported costs.[12] Patients were also asked whether or not they had a companion with them and if that companion had an appointment in the hospital/primary care clinic. Companion costs were excluded from this study if the companion also had an appointment at the hospital/surgery. The data collected from each patient related to a single visit only.

Transportation costs

Data were collected on the mode of transport used in travelling to the clinic. Patients who travelled by car were asked to estimate the approximate distance travelled (in miles) which was multiplied by an average motoring cost per mile of £0.41.[13] This provided an estimate of the full running cost to the patient/companion of the car journey, including running costs, such as petrol, and depreciation in the value of the car owing to the higher mileage. Patients who travelled by taxi or public transport were asked to report their normal fare. Data on the use of, and associated out-of-pocket costs associated with, any other form of transport (e.g. ambulance, walking, cycling) were also collected. The total travel cost incurred by each patient (and companion) in the sample was then estimated.

Time costs

Patients were asked to estimate approximately the time involved in their journey door-to-door and time spent in the clinic. In addition, patients provided an indication of what they and their companion would have been normally doing if they had not been attending the clinic. When work time had been given up, the time estimate was costed using an average wage rate of £9.53 per hour.[14] Non-working time (leisure time) was valued at £3.41 per hour,[15] adopting the principle that non-working time should be valued regardless of the age of the individual.

NHS costs

The NHS costs reported in this paper are based on the results of a separate economic evaluation of primary versus secondary care provision of anticoagulation clinics.[16] This analysis used data from a randomised controlled trial where data on key NHS resource use items, such as the number of visits per patient per year, were collected on all trial patients. The costs incorporated ambulance transfer, building and overheads, equipment, postage, quality assurance, staff time, and test consumables. The published NHS cost estimates have been adjusted for this analysis to reflect current routine practice and equipment costs (i.e. 40 patients per practice and a coagulation machine at £400 and near-patient testing software at £500). This gives a mean per patient per year cost of £97.00 (£93.66 for non-domicilliary patients and £130.84 for domiciliary patients). This is shown in Table 1.

Perspective

The question of the importance of perspective for this cost analysis was addressed by initially reporting NHS costs alone and then subsequently broadening the perspective to include the costs incurred by both the NHS *and* patients (since there were no important category 3 costs). The patient samples from the main trial and the patient cost sur-

Table 1. NHS and patient costs: main findings and sample information.

	Primary care	Secondary care	*P*-value
Costs to the NHS[a]			
Resource costs per year			
Software, coagulation machine, maintenance, training	14.46	1.80	<0.001
Test consumables	4.00	5.84	<0.001
Staff costs	34.65	34.33	0.98
Overheads, postage	22.92	8.02	<0.001
Quality control	17.63	0.22	<0.001
Domicilliary, ambulance	3.38	18.87	<0.001
Mean NHS cost per year (£)	97.00	69.00	<0.001
Mean number of visits per year	10	7	<0.001
Mean NHS cost per visit (£)	9.70	9.86	0.48
Patient cost survey results			
Number of patients	46	99	
Female:male ratio	20:26	50:49	0.25
Mean age (years)	70.2	67.5	0.25
With companion (%)	32	46	0.11
Mean travel time (minutes)	24	49	<0.001
Mean travel cost (£)	1.81	4.67	<0.001
Mean time in clinic (minutes)	23.4	34.3	<0.001
Mean time cost (£)	4.00	8.97	<0.001
Mean patient cost per visit (£)	6.78	14.58	<0.001
Mean patient cost per year (£)	67.76	102.07	<0.001
Mean NHS plus patient cost per year (£)	164.76	171.07	0.52

[a]Costs based on an economic evaluation of a randomised controlled trial.[16]

vey were different and so an assumption of statistical independence between the cost elements was made.

Analysis

Analysis was conducted using the software SAS (version 6.12) and Stata (version 5). Total patient costs were calculated by summing costs associated with travel, time, and other expenses. All costs were converted to a common price year of 1998. The principal comparison between secondary care and primary care was in terms of patient costs and involved testing for a difference between means using an unpaired *t*-test.[17] The validity of using the parametric *t*-test was verified by comparison with 1000 bootstrap resamples.[18] In addition, the two cohorts of patients were compared in terms of the mode of transport used and the proportion of patients accompanied on their clinic attendance (both involving a χ^2 test).[17] Missing cost data (7% of cases) for car costs were imputed using linear regression with age, sex, treatment location, and duration of journey as the independent variables.

Sensitivity analysis was carried out on the value of time. For work time, the value was varied between £5 and £15 per hour and for non-working time the value was varied between £0 and £5 per hour. In addition, the robustness of the result towards variation in the mean number of patient visits per year was explored. Data from the clinical trial suggest that primary care provision of services was associated with a significantly higher number of visits, as shown in Table 1. However, this difference has not been maintained in post-trial routine practice and so the sensitivity analysis considered the impact of assuming no difference between groups in the number of visits per year.

Results

In primary care, a total of 49 consecutive patients were recruited into the survey and 104 patients from secondary care. Table 1 provides a summary of the data collected and the results. Complete data were obtained for 46 patients in primary care and 95 in secondary care, giving an overall response rate of 92%. No statistically significant differences were found in terms of age, sex or occupational status between the primary and secondary care groups. While patients in primary care were less likely to have a companion with them than patients in secondary care, this difference was not statistically significant ($P = 0.11$).

The patient cost per visit was significantly higher in the secondary care arm. The mean (standard deviation) patient cost per visit in primary care was £6.78 (5.04) versus £14.58 (9.08) in secondary care. This finding was driven, in part, by a statistically significant difference in travel time (in primary care the average return journey time was 24 minutes versus 49 minutes in secondary care) but also by a greater tendency to travel by car or public transport to secondary care clinics (Table 2). Similarly, primary care patients also spent less time in the clinic in comparison with patients in secondary care: mean (SD) = 23 minutes (8.62 minutes) versus 34 minutes (13.86 minutes). The 'other costs' reported by patients were negligible in both groups.

The earlier economic analysis found that the NHS cost per visit was similar for primary and secondary care (i.e. £9.70 and £9.86 respectively) but that the number of visits per year was greater in primary care than in secondary care (i.e. 10 and seven visits respectively). As a result, the NHS cost per patient per year was significantly higher for primary care (i.e. £97 and £69 respectively; $P<0.001$). Bringing together the NHS and patient costs, there is no statistically significant difference between primary and secondary care in the overall cost per patient per year. Costs to the patient account for

Table 2. Mode of travel.

	Primary care		Secondary care	
	Frequency	%	Frequency	%
Car	22	45	58	53
Taxi	6	12	14	13
Public transport	6	12	24	22
Ambulance	0	0	7	6
Walk	12	24	0	0
Missing data	3	6	6	6

41% of the overall cost in primary care and 60% in secondary care.

In the sensitivity analysis the non-working time cost per hour of the patients and companions was set to zero. While the absolute level of the NHS plus patient cost in both arms was sensitive to this change, the policy implication of the result remained unchanged: there was still no statistically significant difference between costs in primary or secondary care (Table 3). The same pattern of findings was seen when the non-working time cost per hour increased to £5, the working time cost per hour was reduced to £5, and the working time cost per hour increased to £15. The results were, however, highly sensitive to variation in the between-group difference in the mean number of visits per patient per year. An assumption of no difference (i.e. seven visits per year in both groups) resulted in a significantly higher societal cost per patient for secondary care (Table 3).

Discussion

This survey has demonstrated that the costs to patients in receiving anticoagulation management are significantly lower in primary care. The main factors influencing this finding were the shorter journey to the primary care clinic, the subsequent higher use of 'free transport' (i.e. walking and cycling) by primary care patients, and the shorter duration of a visit in primary care. These findings reflect the fact that primary care clinics are more geographically widespread and there is a greater likelihood that a patient will live closer to their primary care clinic than their secondary care clinic. They also indicate that, when a service is provided centrally for a large area by secondary care, there is likely to be more pressure on the service than if it were provided locally by primary care, with a consequence of longer waiting times in the clinic.

This study is the first instance of an economic evaluation of anticoagulation services which provides analysis using both a narrow health sector perspective and a broader perspective to include patient costs. In this instance, for the base-case analysis, the adoption of the NHS perspective alone resulted in a lower cost for secondary care, whereas, from the broader perspective, there was no cost advantage for secondary care. It is important to remember that information on costs represents only part of the data required to address questions of efficiency. Patient preferences relating to alternative locations have not been explored in this research but remains an important area for future study.

Table 3. Sensitivity analysis of NHS plus patient cost per year (£).

	Primary care	Secondary care	*P*-value
Leisure time = £0	121.48	116.83	0.51
Leisure time = £5	197.57	206.19	0.32
Working time = £5	170.36	170.56	0.98
Working time = £15	176.99	186.45	0.29
Mean number of visits per patient per year = 7 in both arms	115.36	171.07	<0.001

The results of this economic analysis are highly sensitive to variation in the difference between primary and secondary care in the number of clinic visits per patient per year. In routine practice in primary care, if the number of visits is similar to that in secondary care, as appears to be the case from the post-trial follow-up data, then the health sector costs are not significantly different. This in fact has proven to be the case in a follow-up study, with routine recall being around 35 days in both hospital and primary care clinics.[19] However, the adoption of the broader perspective including patient costs, under the assumption of no difference in the number of visits per year, results in a significantly lower cost for primary care provision.

A potential weakness of this paper is that the analysis of patient costs was not based on data from a randomised controlled trial. It is therefore possible that the patients we observed attending at primary care were from practices who had self-selected to provide anticoagulation monitoring because they are furthest away from secondary care centres. If this is the case then this represents a bias in the data we report. However, we do not believe that there is a strong bias owing to practice selection, for two reasons. First, the selection of practices was undertaken from practices initially recruited to participate in an Medical Research Council funded trial where generalisation was extremely important. These practices thus represented a broad spread of inner-city, urban, and rural environments. Second, for the personal characteristics variables collected in this study, no statistically significant differences between groups were found. Another possible weakness of this patient cost study is that it relied entirely upon data provided by patients. Data on such variables as travel distance may be inaccurate, although there is no reason to expect errors systematically in one direction. The data were checked for clear outliers and none were found.

The analysis reported in this paper demonstrates that the broadening of the perspective of an economic analysis beyond the health sector can bring about a marked change in the nature of the result. This is an important finding that challenges researchers investigating issues at the interface of primary and secondary care to consider explicitly the issue of perspective in economic analysis. We would argue that anything other than a full societal perspective requires detailed justification. From a health sector policy or decision-making point of view, the implications of this finding are less clear. The resources at the disposal of such policy makers are solely for the provision of health care services and so their decisions will primarily be driven by a concern to maximise health gain with the given health care budget. However, in the context of decisions between programmes that are finely balanced, the additional information provided by adopting a broader perspective may clarify the appropriate choice to be made.

References

1. Wheeldon NM, Taylor DI, Anagnostou E, *et al*. Screening for atrial fibrillation in primary care. *Heart* 1998; **79(1):** 50-55.
2. Lip GY, Gilding DJ, Nazir M, *et al*. A survey of atrial fibrillation in general practice: the West Birmingham Atrial Fibrillation Project. *Br J Gen Pract* 1997; **47(418):** 285-289.
3. Ezekowitz MD. Atrial fibrillation: the epidemic of the new millennium. *Ann Int Med* 1999; **131(7):** 537-538.
4. Taylor F, Ramsey M, Voke J, Cohen H. GPs not prepared for monitoring anticoagulation. *BMJ* 1993; **307:** 1493.
5. Fitzmaurice DA, Hobbs DR, Murray ET. Primary care anticoagulation clinic management using computerized decision support software and near patient International Normalized Ratio (INR) testing: routine data from a practice nurse-led clinic. *Fam Pract* 1998; **15(2):** 144-146.
6. Macgregor SH, Hamley JG, Dunbar JA, *et al*. Evaluation of a primary care anticoagulant clinic managed by a pharmacist. *BMJ*, 1996; **312:** 560.
7. Fitzmaurice DA, Hobbs FDR, Murray ET, *et al*. Oral anticoagulation management in primary care with the use of computerized decision support and near-patient testing: randomized, controlled trial. *Arch Intern Med* 2000; **160:** 2343-2348.
8. Drummond MF, O'Brien B, Stoddart GL, Torrance GW. *Methods for the economic evaluation of health care programmes*. 2nd edition. Oxford: Oxford University Press, 1997.
9. Gold MR, Siegal JE, Russell LB, Weinstein MC (eds). *Cost-effectiveness in health and medicine*. Oxford: Oxford University Press, 1996.
10. Sculpher MJ, Buxton MJ, Ferguson BA, *et al*. Screening for diabetic retinopathy: a relative cost-effectiveness analysis of alternative modalities and strategies, *Health Econ* 1992; **1:** 39-51.
11. Brown J, Bryan S, Warren R, Mammography screening: an incremental cost effectiveness analysis of double versus single reading of mammograms. *BMJ* 1996; **312:** 809-812.
12. Bryan S, Buxton M, McKenna M, *et al*. Private costs associated with abdominal aortic aneurysm screening: the importance of private travel and time costs. *J Med Screen* 1995; **2:** 62-66.
13. Automobile Association Technical Group (Motoring costs). *AA Technical Group Report*. London: AA, 1998.
14. Office of National Statistics. *Labour market trends*. London: ONS, 1999.
15. Department of Transport. *Values of time and vehicle operating costs.* London: DoT, 1997.
16. Parry DJ, Fitzmaurice DA, Raftery JP. Anticoagulation management in primary care: a trial based economic evaluation. *Br J Haematol* 2000; **111:** 530-533.
17. Hill AB, Hill ID. *Principles of medical statistics.* 12th edition. London: Arnold, 1991.
18. Barber JA, Thompson SG, Analysis and interpretation of cost data in randomised controlled trials: review of published studies. *BMJ* 1998; **317:** 1195-1200.
19. Fitzmaurice DA, Murray ET, Gee KM, Allan TF. Does the Birmingham model of oral anticoagulation management in primary care work outside trial conditions? *Br J Gen Pract* 2001; **51:** 828-829.