Controlled trial of pharmacist intervention in general practice: the effect on prescribing costs

SARAH RODGERS

ANTHONY J AVERY

DAVID MEECHAN

SANDRA BRIANT

MICHAEL GERAGHTY

KEITH DORAN

DAVID K WHYNES

SUMMARY

Background. *It has been suggested that the employment of pharmacists in general practice might moderate the growth in prescribing costs. However, empirical evidence for this proposition has been lacking. We report the results of a controlled trial of pharmacist intervention in United Kingdom general practice.*
Aim. *To determine whether intervention practices made savings relative to controls.*
Method. *An evaluation of an initiative set up by Doncaster Health Authority. Eight practices agreed to take part and received intensive input from five pharmacists for one year (September 1996 to August 1997) at a cost of £163 000. Changes in prescribing patterns were investigated by comparing these practices with eight individually matched controls for both the year of the intervention and the previous year. Prescribing data (PACTLINE) were used to assess these changes. The measures used to take account of differences in the populations of the practices included the ASTRO-PU for overall prescribing and the STAR-PU for prescribing in specific therapeutic areas. Differences between intervention and control practices were subjected to Wilcoxon matched-pairs, signed-ranks tests.*
Results. *The median (minimum to maximum) rise in prescribing costs per ASTRO-PU was £0.85 (-£1.95 to £2.05) in the intervention practices compared with £2.55 (£1.74 to £4.65) in controls (P = 0.025). Had the cost growth of the intervention group been as high as that of the controls, their total prescribing expenditure would have been around £347 000 higher.*
Conclusion. *This study suggests that the use of pharmacists did control prescribing expenditure sufficiently to offset their employment costs.*

Keywords: prescribing; pharmacists; general practice; controlled trial.

S Rodgers, Bsc, researcher; and A J Avery, DM MRCGP, senior lecturer, Division of General Practice, Medical School, Queen's Medical Centre, Nottingham. D Meechan, Bsc Msc, assistant director of health policy and public health; S Briant, Bsc MRPharms, pharmaceutical advisor; M Geraghty, prescribing analyst; and K Doran, MBCLB, medical director, Doncaster Health Authority, Doncaster. D K Whynes, BA BPhil MLitt, professor, Department of Economics, University of Nottingham.

Introduction

IN 1993/4 Doncaster Health Authority had the highest general practice prescribing costs per patient of all authorities in the country. The authority decided to take radical action by investing in a scheme whereby pharmacists would work in general practices and support general practitioners' (GPs') prescribing activities with the aim of controlling prescribing costs while maintaining or improving the quality of prescribing. While previous reports have suggested that there are benefits to employing pharmacists in general practices,[1-4] little has been done by way of economic evaluation. In cases where financial gains have been cited,[5-7] it is difficult to say whether the savings made have been primarily a result of the employment of the practice pharmacist, rather than of any other factors. To address this issue we have conducted a controlled trial of pharmacist intervention in general practice. The objectives of the study were to determine whether intervention practices made savings in prescribing costs compared with matched controls, and whether any savings covered the costs of the intervention.

Method

In 1996, Doncaster Health Authority offered all of its 50 practices the services of dedicated pharmacists. The intended role of the pharmacists was to work with the practices to help control prescribing costs while maintaining or improving prescribing quality. Eight practices volunteered to join the scheme and received intensive input from five pharmacists for a 12-month period (September 1996 to August 1997).

The Health Authority provided the practices with feedback on their prescribing, and each practice decided on its own priorities for action. The scheme did not require a large time commitment from GPs because the pharmacists were able to make agreed changes to patients' medications and deal with patients' questions and concerns.

The pharmacists were asked to record their actions in diaries. These actions included generic substitution of brand-named drugs, clinical audit, repeat prescription reviews, formulary reviews, and the setting up of pharmacist-run asthma and gastrointestinal clinics in order to review patient medication. The total cost of the scheme, including employment of the pharmacists, training, and set-up, was £163 000.

Before the intervention took place, the practices were individually matched with controls on the basis of several characteristics that might have an influence on changes in prescribing costs. These were fundholding status, dispensing status, list size, limiting long-term illness and NIC (net ingredient cost) per age, sex, and temporary resident-originated prescribing unit (ASTRO-PU)[8] for the quarter January to March 1996. Four of the paired practices were fundholding while one pair had dispensing status. The median list sizes (minimum to maximum) for the intervention and control practices were 8285 (1370–11 674) and 8394 (2065–13 261) respectively. The interquartile ranges for the list sizes were 2984 to 10 874 and 4909 to 9814 respectively. Postcodes of individual patients in each practice were applied to Census data to estimate the percentage of patients with limiting long-term illness in each of the two groups.[9] The median estimated percentages (minimum to maximum) were 15.6 (13.0–17.2)

and 15.4 (9.1–17.6) respectively. The median NIC per ASTRO-PU for January to March 1996 (minimum to maximum) was £6.39 (£5.23–£10.69) for intervention practices and £6.44 (£5.44–£8.13) for controls. Using the Mann–Whitney U test, there were no statistically significant differences between intervention and control practices.

Monthly PACTLINE data for the period September 1995 to August 1997 were obtained for the 16 practices under investigation. These data comprised prescribing costs (NIC), numbers of items prescribed, and the percentage of these items prescribed generically. The data also contained prescribing units (PU) for each practice (a PU assigns a weighting of three to patients aged 65 and over, and a weighting of one to all other patients). For the purposes of the evaluation, the monthly data were combined (or averaged in the case of PUs) to give yearly data for each practice for both the year of the intervention (September 1996 to August 1997) and the year before the intervention (September 1995 to August 1996). PUs were assigned to data on costs (NIC) and items to give NIC/PU and items/PU. Also, the data on costs and items were added together to give overall figures for the eight intervention practices and eight control practices for each of the two years.

Although we made use of the PU in our study, the ASTRO-PU is considered to be a more appropriate denominator for measuring changes in overall prescribing costs.[8] This is because it takes more account of the cost implications of changes in the age–sex distribution of practice populations.[8] Therefore, ASTRO-PU figures (which were available on a quarterly basis from Doncaster Health) were assigned to the relevant monthly PACTLINE data for each practice. This allowed us to calculate NIC/ASTRO-PU and items per ASTRO-PU for each practice for each of the two years. Also, by combining the ASTRO-PU figures, we were able to calculate NIC/ASTRO-PU and items/ASTRO-PU for the two groups of practices.

STAR-PUs (specific therapeutic area-related prescribing units)[10] are considered to be appropriate denominators for measuring changes in prescribing costs within British National Formulary (BNF) therapeutic chapters.[10] For each of these chapters, STAR-PUs assign weightings to patients according to their age and sex; to take account of demographic differences in the use of different types of drugs.[10] In our study, STAR-PU figures for each practice were obtained for chapters one to six and 10 of the BNF for quarters ending March 1996 and March 1997. Using the PACTLINE data for each of these BNF chapters, we calculated costs (NIC) per STAR-PU for each of the intervention and control practices.

One of the main objectives of the study was to calculate any savings made by intervention practices compared with controls. Relative savings were calculated by applying the percentage increase in NIC per ASTRO-PU of control practices to intervention practices for the year September 1995 to August 1996 to give a projected NIC per ASTRO-PU for the year of the intervention. This figure was then multiplied by the mean number of ASTRO-PUs for intervention practices for the period September 1996 to August 1997 to give projected total costs. The actual costs of the intervention practices were then subtracted from the projected costs to give an estimate of the relative savings made.

In order to compare changes in prescribing costs for intervention and control practices with other practices, data were obtained from the Trent region as a whole and for the 10 most similar health authorities in England (selected by the Prescribing Support Unit, Leeds, on the basis of sociodemographic characteristics).

Statistical analyses were performed using SPSS-PC. Differences between intervention and control practices between the period September 1995 to August 1996 and the same period in 1996/7 were investigated using simple non-parametric methods (Wilcoxon matched-pairs, signed-ranks tests). The primary analysis was conducted on changes in overall prescribing variables using a significance level of $P<0.05$. Secondary analysis was performed on changes in prescribing at BNF chapter level.

Results

The results from the analysis of PACTLINE data for overall prescribing are shown in Table 1. It can be seen that the change in NIC per ASTRO-PU for intervention practices was significantly lower than the change in NIC per ASTRO-PU for controls ($P = 0.025$). Similar results were obtained using PUs as the denominator. The intervention practices achieved a significantly higher growth in generic prescribing ($P = 0.025$), despite their median baseline proportion of generics being higher than that of controls. While there were small changes in the number of items prescribed per ASTRO-PU (or PU) in both intervention and control practices, there were no significant differences between the two groups.

Table 2 shows combined data for the intervention and control practices between September 1995 and August 1996, and September 1996 and August 1997. It can be seen that intervention practices increased their NIC per ASTRO-PU by 3.4% compared with a 9.2% increase for controls. Had the cost growth of the intervention group been as great as that of the control group, their total prescribing expenditure would have been around £347 000 higher. Given that the cost of the scheme was £163 000, it is estimated that the project made a net saving of £184 000. For the same time period, the percentage increase in NIC per ASTRO-PU for the control practices was similar to that of practices in the 10 most similar health authorities in England (8.5%) (Dave Roberts, Prescribing Support Unit, personal communication, 1998) and the Trent region as a whole (8.4 %) (John Wilson, personal communication, 1999).

The results of the analysis of changes in PACTLINE data at BNF chapter level are shown in Table 3. Statistically significant differences between intervention practices and controls were found in chapters one ($P = 0.035$) and five ($P = 0.036$). Also, there are some consistent trends in the data. In each of the other chapters, the intervention practices appeared to contain costs more effectively than controls.

Discussion

Compared with previous studies, this evaluation has advantages in the fact that a control group was used. The controls were selected before the intervention and were reasonably well matched on baseline characteristics. While a randomized control trial would give more reliable results, we believe that our study gives some of the best evidence currently available on the effects of practice pharmacist intervention on prescribing costs. We have shown that intervention practices managed to contain their prescribing costs relative to controls and that the relative savings were more than enough to cover the costs of the intervention. Also, we have evidence that the relative differences between the two groups of practices were not the result of control practices increasing their costs at an extraordinary rate. This allows us to say, with some degree of confidence, that the changes observed in the intervention practices were not the result of chance alone or a result of natural changes in prescribing patterns. Nevertheless, it is possible that, even without pharmacist support, these practices would have made savings on their prescribing costs relative to controls.

In this paper it is not possible to give a detailed account of exactly how practices changed their prescribing costs.

Table 1. Changes in prescribing variables for intervention practices between September 1995 and August 1997 compared with matched controls.

	Median data for intervention practices (minimum to maximum)			Median data for control practices (minimum to maximum)			Wilcoxon test	
	Sept to Aug 95/96	Sept to Aug 96/97	Median difference	Sept to Aug 95/96	Sept to Aug 96/97	Median difference	Z	Two-tailed P
NIC per ASTRO-PU (£)	26.79 (22.70–44.25)	27.31 (22.82–43.69)	0.85 (-1.95–2.05)	26.99 (22.69–32.91)	29.44 (24.43–36.17)	2.55 (1.74–4.65)	-2.24	0.025
NIC per PU (£)	68.14 (53.43–111.5)	70.08 (54.85–112.4)	3.08 (-4.9–7.3)	68.65 (59.17–82.51)	76.9 (63.92–90.86)	7.09 (4.75–11.87)	-2.24	0.025
Number of items per ASTRO-PU	3.61 (2.43–5.67)	3.55 (3.02–5.66)	0.05 (-0.26–0.59)	3.44 (2.77–5.12)	3.50 (2.86–5.04)	0.08 (-0.09–0.31)	-0.28	0.779
Items per PU	9.23 (6.21–14.35)	8.98 (7.84–14.62)	0.26 (-0.7–1.63)	8.88 (7.26–12.6)	9.06 (7.51–12.63)	0.22 (-0.7–0.89)	-0.56	0.585
Items prescribed generically (%)	55.31 (42.18–67.08)	59.60 (45.92–68.84)	4.00 (1.76–10.18)	50.66 (30.80–64.93)	52.92 (29.91–67.87)	1.67 (-0.90–3.28)	-2.24	0.025

Table 2. Changes in combined overall prescribing variables for intervention practices between September 1995 and August 1997 compared with matched controls.

	Combined data for intervention practices				Combined data for control practices			
	Sept to Aug 95/96	Sept to Aug 96/97	Actual difference	Percentage change	Sept to Aug 95/96	Sept to Aug 96/97	Actual difference	Percentage change
NIC per ASTRO-PU (£)	27.34	28.26	0.92	3.37	26.82	29.28	2.46	9.17
Number of items per ASTRO-PU	3.53	3.63	0.10	2.80	3.35	3.42	0.07	2.23
Items prescribed generically (%)	58.49	62.67	4.18	7.15	52.63	54.67	2.04	3.87

Table 3. Changes in net ingredient cost per STAR-PU for chapters one to six and 10 of the BNF for intervention practices between September 1995 and August 1997 compared with matched controls.

	Median NIC/STAR-PU data for intervention practices (minimum to maximum)			Median NIC/STAR-PU data for control practices (minimum to maximum)			Wilcoxon test	
	Sept to Aug 95/96	Sept to Aug 96/97	Median difference	Sept to Aug 95/96	Sept to Aug 96/97	Median Difference	Z	two-tailed P
Chapter 1: Gastrointestinal system	1.96 (1.49–3.78)	1.96 (1.55–3.11)	0.01 (-0.67–0.14)	2.12 (1.56–2.47)	2.29 (1.72–2.86)	0.15 (0.05–0.39)	-2.10	0.035
Chapter 2: Cardiovascular system	1.76 (1.63–3.75)	1.91 (1.55–3.72)	0.05 (-0.08–0.25)	1.97 (1.77–2.55)	2.18 (1.93–2.70)	0.17 (-0.03–0.29)	-1.12	0.263
Chapter 2.12: Lipid-lowering drugs	0.10 (0.06–0.16)	0.18 (0.12–0.29)	0.08 (0.06 to 0.14)	0.11 (0.04–0.25)	0.22 (0.09–0.38)	0.10 (0.04–0.17)	-1.40	0.161
Chapter 3: Respiratory system	3.09 (1.60–5.42)	2.92 (2.04–5.44)	0.08 (-0.37–0.44)	2.95 (2.07–4.46)	3.19 (2.39–4.41)	0.18 (-0.05–0.39)	-0.70	0.484
Chapter 4: Central nervous system	2.24 (1.91–4.32)	2.55 (1.97–4.18)	0.33 (-0.32–0.63)	2.24 (1.76–2.70)	2.58 (2.16–3.35)	0.37 (0.23–1.12)	-0.70	0.484
Chapter 5: Infections	1.87 (1.62–3.03)	1.71 (1.37–2.68)	-0.26 (-0.51 to -0.07)	1.90 (1.46–3.21)	1.93 (1.28–2.97)	-0.07 (-0.23–0.11)	-2.10	0.036
Chapter 6: Endocrine system	2.17 (1.69–3.92)	2.12 (1.84–4.29)	0.11 (-0.22–0.37)	2.11 (1.76–2.36)	2.11 (1.95–2.64)	0.22 (-0.13–0.50)	-0.42	0.674
Chapter 10: Musculoskeletal & joint diseases	1.65 (1.17–2.07)	1.66 (1.41–2.14)	-0.05 (-0.22–0.24)	1.43 (1.31–3.15)	1.50 (1.22–2.98)	-0.02 (-0.17–0.21)	-0.14	0.889

Also, some caution is needed in the interpretation of the results. First, the statistical significance of changes at BNF chapter level need to be viewed critically because of the multiple comparisons made. Secondly, some of the differences between intervention and control practices at baseline were of similar magnitude to the change between baseline and follow-up. Nevertheless, on the basis of our results it seems likely that substantial savings were made due to generic substitution. However, this is unlikely to explain how practices controlled expenditure for gastrointestinal drugs where a high proportion of costs come from drugs that are still within patent. According to pharmacist diaries, clinics were specifically set up to review patients taking ulcer-healing drugs, and a number of changes to medication were made. These included *Helicobacter pylori* eradication and changing proton pump inhibitors to lower doses, less expensive preparations, or alternative drugs.

While this study suggests that pharmacist intervention has enabled practices to control their prescribing costs, it is important to consider the generalizability of the results. It is possible that the changes observed were strongly influenced by the characteristics of the volunteer practices and pharmacists.

The practices involved in the project came from a health authority with relatively high prescribing costs, and it is possible that savings of the scale shown in this evaluation might not be replicated in other parts of the country. This was a voluntary project that included interested GPs only. Indeed, although we carefully matched intervention and control practices, they differed on the important issue of whether they took up the offer of pharmacist support. It is doubtful whether our results would be replicated in practices that did not want help from a practice-based pharmacist.

Also, there is the possibility that the pharmacists working in the intervention practices were particularly gifted and that other projects might have difficulties in attracting people of such high calibre. It should be noted that the pharmacists employed in the project had at least five years' experience and were all considered appropriate to be employed at senior/principal level. Finally, the personnel involved in the project knew that the project was being evaluated, and the pharmacists may have perceived that their jobs were unlikely to continue unless they had achieved some degree of success at controlling costs or improving the quality of prescribing.

These factors may have increased the motivation of both practices and pharmacists. In other circumstances one might not find such marked changes in prescribing as a result of pharmacist intervention. Also, it is necessary to recognize that the benefits of pharmacist intervention may be short-lived, as previous studies have shown a tendency for GPs to revert to old habits after prescribing intervention has ceased.[11]

Nevertheless, our findings have important implications for primary care groups, as they support the idea that the employment of pharmacists in general practices may help to control prescribing costs. Previous work has suggested that the majority of GPs are sympathetic to the idea of controlling prescribing costs where there is no detriment to patients;[12] however, the major problem that they face is lack of time.[13] Changes in medication can prove to be time consuming, particularly when large numbers of patients' notes need to be reviewed and/or patients need to be invited to specially arranged clinics. Receiving intensive input from pharmacists may not only help to overcome this problem, but also bring additional benefits to both patients and the rest of the primary care team.[14]

Conclusions

This evaluation has shown that intervention practices made sig-

nificant savings in their prescribing costs relative to matched controls. Had the cost growth of the intervention group been as great as that of the control group, their total prescribing expenditure would have been around £347 000 higher. This was more than twice the cost of employing the pharmacists and providing training and support.

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Address for correspondence

A J Avery, Division of General Practice, The Medical School, Queen's Medical Centre, Nottingham NG7 2UH. E-mail: tony.avery@nottingham.ac.uk