Do prescribing formularies help GPs prescribe from a narrower range of drugs? A controlled trial of the introduction of prescribing formularies for NSAIDs

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SUMMARY

Background. *Previous studies have suggested that prescribing formularies may promote rational prescribing. The range of drugs prescribed may be one aspect of rational prescribing.*

Aim. *To determine whether the introduction of prescribing formularies helps general practitioners (GPs) to prescribe from a narrower range of non-steroidal anti-inflammatory drugs (NSAIDs).*

Method. *General practices in Lincolnshire were offered help in developing prescribing formularies. Ten practices decided to develop a formulary for NSAIDs. Level 3 PACT data were used to determine whether changes in prescribing had occurred with the introduction of the formulary. Matched controls were used to determine whether similar changes had occurred in other practices.*

Results. *Between April and June 1992, and during the same period in 1993, practices that introduced a formulary for NSAIDs reduced the mean number of different drugs used (14.3 versus 13.1, P = 0.04) and increased the percentage of NSAID-defined daily doses coming from the three most commonly used drugs (70.1% versus 74.8%, P = 0.02). Similar changes were not seen in control practices.*

Conclusion. *Following the development of a formulary for NSAIDs, practices prescribed from a narrower range of drugs and focused a greater proportion of their prescribing on their three most commonly used drugs.*

Keywords: prescribing patterns; drug formularly; controlled trials; NSAIDs.

Introduction

IN the past few years, there has been an increase in the use of prescribing formularies in general practice. This has been promoted by articles in the literature,[1-3] and by publications from the Royal College of General Practitioners[4,5] and the previous Government.[6,7]

The principal reasons for using formularies are to promote rational prescribing[1,3,5-8] and to limit costs.[6] McGavock has suggested that 'working with a more limited range of medicines, the general practitioner can ... become ever more knowledgeable about commonly used drugs.'[9] If prescribing formularies can help GPs to prescribe from a narrower range of drugs selected for efficacy, safety, and economy, then this may lead to more rational prescribing. However, what is the evidence that the development of prescribing formularies in general practice actually alters prescribing habits?

A number of studies have looked at the impact of the introduction of prescribing formularies in general practice. Most of these studies have shown changes in prescribing over time towards greater compliance with a formulary.[2,10-12] For example, Field[10] found that with the introduction of a formulary in one practice there was a statistically significant increase in prescriptions from the formulary over the course of two years (72% versus 81%, $P<0.01$). Grant and others[2] found that giving feedback on formulary usage to a 'diverse group of general practitioners from separate practices' resulted in increased compliance with the formulary. Green[11] was involved with the production of a prescribing formulary in one general practice. Statistically significant increases in numbers of items prescribed from the formulary were demonstrated for five therapeutic groups. Hill-Smith[12] was involved in the introduction of a district drug formulary. When comparing participating practices with controls, statistically significant increases occurred in the proportion of prescription items coming from the formulary for certain drug groups. In contrast, Wyatt *et al*[13] showed a fall in compliance with an anti-infective prescribing formulary following its introduction in one general practice. However, a number of factors such as high initial compliance with the formulary and drug company marketing may have influenced this result.

While these studies are helpful in demonstrating some changes in prescribing with the introduction of a formulary, they have limitations. For example, the studies by Field,[10] Green,[11] and Wyatt *et al*[13] took place in single general practices and no control group was used. Prescribing habits are known to change over time without any specific intervention, and therefore it is uncertain whether the changes observed in these practices were a result of the introduction of a formulary. In the study by Grant *et al*,[2] a control group was used. However, the controls were not matched in any way to the cases and no statistical analysis was reported. The study by Hill-Smith[12] used a control group consisting of all the practices in Bedfordshire that had not participated in formulary development. The characteristics of the practices were not given.

The study reported here was designed to address some of the limitations of previous studies. There were two main objectives. The first was to show whether general practices prescribed from a narrower range of drugs when they introduced a prescribing formulary. The second was to determine whether any changes in prescribing differed from matched control practices not using formularies. Another objective was to determine whether the methods used in this study could be applicable to larger studies of the impact of prescribing formularies in general practice.

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The study focused on the introduction of practice-based prescribing formularies for non-steroidal anti-inflammatory drugs (NSAIDs). This group of commonly used drugs provides GPs with a wide range of choices. There is little evidence that these drugs differ in efficacy;[14,15] however, there are differences in terms of safety[15,16] and cost.[15] Therefore, this group of drugs is one in which practices might aim to prescribe from a narrower range after the introduction of a prescribing formulary.

Method

A letter was sent to each of the 108 general practices in Lincolnshire, in June 1992, to ask if they would be interested in receiving help to develop a prescribing formulary. Ten practices said that they already had a formulary and a further 21 practices expressed an interest in developing a formulary. These practices were contacted again, given a list of nine classes of drug, and asked to choose one of these as their starting point for formulary development. The most popular class of drug was NSAIDs and we report the results from the 10 practices that chose to develop a formulary for these drugs. The other drug groups were not chosen by a sufficient number of practices to allow for meaningful statistical analysis.

Each of the practices was asked to give permission for the project team to have access to their level 3 PACT data. This was obtained from the medical adviser to the Lincolnshire Family Health Services Authority for the quarters April–June 1992 (before the development of formularies) and April–June 1993 (after the development of formularies). The level 3 PACT data were entered onto an Excel 4.0 spreadsheet.

The practices were visited by a GP from the Lincolnshire Medical Audit Advisory Group (MAAG) together with an audit assistant. Practices were given advice based on the publication *How to produce a practice formulary*.[5] They were also given feedback on their prescribing of NSAIDs based on their (April–June 1992) level 3 PACT data (Box 1). It was suggested that practices use this information as a basis for their discussions on which drugs to select for their formularies. In addition, eight of the practices used further information (e.g. from *Drug and Therapeutics Bulletin*) to help inform their decisions on formulary development, and one of the practices used a family health services authority prescribing adviser. Apart from the single-handed doctors, all of the practices had meetings to discuss the development and implementation of their formularies.

- Number of times a particular drug was dispensed
- Relative frequency with which each drug was dispensed
- Percentage of drugs dispensed which were prescribed generically
- Total cost of each drug prescribed
- Average cost per prescription for each drug dispensed
- Bar charts showing relative frequency with which each drug was dispensed.

Box 1. Feedback given to practices on their prescribing of NSAIDs.

Following the introduction of a prescribing formulary for NSAIDs between July 1992 and March 1993, the level 3 PACT data for April–June 1992 were compared with data for April–June 1993. A number of outcome measures were used and these are outlined below.

Defined daily doses were used[17] as these are a more accurate measure of prescribing volume than items.[18] Prescribing units were used as the denominator for some of the outcome measures to take some account of increased prescribing in the elderly (prescribing units are calculated as the number of patients aged less than 65 years in a practice plus three times the number of patients aged 65 years or over).

Percentage compliance with drugs listed on a formulary for NSAIDs was used to measure changes in prescribing in those practices that had developed a formulary. However, it was also necessary to have measures of whether these practices had focused their prescribing on a narrower range of drugs compared with control practices. We used the percentage of NSAID defined daily doses prescribed from the three drugs most commonly dispensed on behalf of each practice. This measure has been shown to be associated with rational prescribing of NSAIDs.[19] We also used the number of different NSAIDs dispensed on behalf of each practice.

The number of NSAID defined daily doses per 1000 prescribing units was used as a measure of prescribing volume. The percentage of dispensed NSAID defined daily doses that were prescribed generically and NSAID costs per 1000 prescribing units were used to measure generic prescribing and costs respectively.

For the 10 practices that developed a formulary for NSAIDs between June 1992 and March 1993, matched controls were selected from other practices in Lincolnshire. The practices were matched on the basis of factors that might influence prescribing patterns. These were absence of a formulary in June 1992, number of partners in the practice,[20] whether or not practices dispensed medications to patients,[21] and whether or not practices were involved in the first three waves of the United Kingdom fundholding scheme. Where there was more than one possible control for any of the formulary project practices, one of these was randomly selected.

Statistical analyses were performed using SPSS-PC. Changes in outcome measures between the period April to June 1992 and the same period in 1993 were investigated using paired *t*-tests. Differences between study practices and control practices were also investigated using paired *t*-tests. The level of statistical significance used in this study was $P<0.05$.

Results

The characteristics of the practices that introduced a formulary for NSAIDs between June 1992 and March 1993 are shown in Table 1, along with the characteristics of matched control practices. The changes that occurred in NSAID prescribing for the practices that introduced a formulary are shown in Table 2. It can be seen that there was a statistically significant decrease in the number of NSAIDs prescribed by the practices. Also, there was a statistically significant increase in the percentage of defined daily doses prescribed from the three drugs most commonly used by a practice.

The 5% increase in the percentage of NSAID defined daily doses prescribed from drugs and preparations listed on the practices' prescribing formularies was not statistically significant ($P = 0.07$). However, the results suggest that practices have shown compliance with the introduction of a formulary for NSAIDs by increasing the percentage of drugs and preparations dispensed in accordance with these formularies. The percentage of NSAIDs prescribed generically increased slightly while the number of NSAID defined daily doses per 1000 patients and the NSAID costs per 1000 patients fell. These changes were small and not statistically significant.

The changes in prescribing in the above practices were compared with those in the matched control practices. The results are shown in Table 3. While it can be seen that the control practices showed little change in their prescribing patterns between the

Table 1. Characteristics of practices that introduced a formulary for NSAIDs and their respective controls.

Pair	Cases			Controls		
	Number of partners	Dispensing practice	Fundholding practice (waves 1–3)	Number of partners	Dispensing practice	Fundholding practice (waves 1–3)
1	6	Yes	Yes	6	Yes	No
2	6	No	Yes	5	No	Yes
3	4	No	Yes	4	No	Yes
4	4	No	Yes	4	Yes	Yes
5	4	No	No	4	No	No
6	2	Yes	No	2	Yes	No
7	2	Yes	No	2	Yes	No
8	1	No	No	1	No	No
9	1	Yes	No	1	Yes	No
10	2	No	No	2	No	No

Table 2. Changes in NSAID prescribing in those practices that introduced a formulary between June 1992 and April 1993.

Variable	Mean (SD)		Mean (SD) difference between April–June	Paired *t*-test	
	April–June 1992	April–June 1993	1992 and 1993	*t*-value (df = 9)	*P*-value
Percentage NSAID ddds[a] from drugs listed on formulary	76.05 (16.44)	81.10 (11.05)	5.05 (7.77)	2.05	0.07
No. of different NSAIDs used	14.30 (1.77)	13.10 (2.73)	-1.20 (1.62)	-2.34	0.04
Percentage NSAID ddds[a] from the 3 most commonly used drugs	70.09 (9.08)	74.77 (9.65)	4.68 (5.26)	2.82	0.02
Percentage NSAID ddds[a] prescribed generically	32.43 (20.86)	34.22 (24.37)	1.79 (11.78)	0.48	0.64
No. of NSAID ddds[a] per 1000 prescribing units	2867.04 (600.98)	2768.75 (652.12)	-98.29 (336.24)	-0.92	0.38
NSAID costs per 1000 prescribing units (£)	901.36 (246.04)	843.40 (284.90)	-57.95 (150.62)	-1.22	0.26

[a]Defined daily doses.

periods April to June 1992 and April to June 1993, the differences between cases and controls were not statistically significant.

Discussion

There are both strengths and weaknesses in this study. In contrast to some of the previous studies on the use of prescribing formularies in general practice, this study involved a number of practices. Also, control practices were used and these were reasonably well matched in terms of practice characteristics and baseline prescribing variables.

Despite these advantages there are weaknesses in the study. First, the practices were not randomized into intervention and control arms before the study took place. Secondly, the sample size was too small to convincingly refute the hypothesis that the introduction of prescribing formularies in general practice makes no difference to prescribing patterns. Thirdly, only one drug group was used in the study. Finally, it would have been useful to have followed the practices up for at least another year, as changes in prescribing may be reversed without continued intervention.[22] Given these limitations, this study may be best regarded as a pilot for larger studies in the future.

The practices involved in the development of a prescribing formulary for NSAIDs were self-selected and must therefore have had a degree of motivation. If the results of this study are applicable to other practices then it is likely that it would be only those practices that were prepared to spend time on the process of formulary development.

Changes in NSAID prescribing following the introduction of a formulary

Following the introduction of a prescribing formulary for NSAIDs, practices reduced the number of different NSAIDs used and increased the percentage of NSAID defined daily doses coming from the three most commonly used drugs. Although the changes that we demonstrated were small, these are important findings as they provide support for the theory that general practices focus their prescribing on a narrower range of drugs after the introduction of a formulary. However, it should be noted that these findings were not based on comparisons with control practices.

The percentage of NSAID defined daily doses coming from drugs that were listed on a practice's prescribing formulary increased by an average of 5%. While this result was not statistically significant, the change is consistent with the findings of previous studies.[2,10-12] There was a slight increase in generic prescribing and a reduction in the volume and cost of NSAID prescribing associated with the introduction of a prescribing formulary. However, these changes were not statistically significant, and Table 3 shows that the control practices exhibited similar changes in prescribing patterns. This suggests that in developing and implementing their formularies, practices did not make deliberate choices in terms of whether to use alternatives to NSAIDs or whether to use less expensive NSAIDs.

The changes in prescribing for the practices that introduced a formulary for NSAIDs were not statistically different from those of matched controls. This means that one cannot be confident

Table 3. Changes in prescribing for NSAIDs comparing level 3 PACT data for practices which developed a formulary between June 1992 and April 1993 compared with matched controls.

Variable	Cases: mean (SD)			Controls: mean (SD)			Mean (SD) difference between cases and controls	Paired *t*-test	
	April–June 1992	April–June 1993	Difference 1992	April–June	April–June 1993	Difference		*t*-value (df = 9)	*P*-value
Number of different NSAIDs used	14.30 (1.77)	13.10 (2.73)	-1.20 (1.62)	14.60 (2.22)	14.60 (2.59)	0.00 (1.63)	1.20 (1.75)	2.17	0.06
Percentage of NSAID ddds[a] coming from the 3 most commonly used drugs	70.09 (9.08)	74.78 (9.56)	4.69 (5.26)	69.29 (12.28)	69.56 (11.10)	0.27 (3.38)	-4.40 (7.73)	-1.80	0.11
Percentage of NSAID ddds[a] prescribed generically	32.43 (20.86)	34.22 (24.37)	1.79 (11.78)	39.36 (16.39)	43.70 (22.10)	4.34 (12.59)	2.56 (15.66)	0.52	0.62
Number of NSAID ddds[a] per 1000 prescribing units	2867.04 (600.90)	2768.75 (652.12)	-98.29 (336.24)	2973.47 (730.49)	2880.56 (676.83)	-92.91 (294.24)	16.00 (185.73)	0.27	0.96
NSAID costs per 1000 prescribing units (£)	901.36 (246.04)	843.40 (284.90)	-57.96 (150.62)	876.13 (271.45)	834.17 (264.77)	-41.96 (101.35)	5.38 (324.27)	0.05	0.79

[a]Defined daily doses.

that these changes were due to the intervention. However, it can be seen from Table 3 that, while the study practices reduced the number of drugs prescribed and increased the percentage of NSAID defined daily doses coming from the three most commonly used drugs, no such changes were observed in the control practices. This suggests that the changes that took place in the study practices were more likely to have been due to the intervention than to other factors unrelated to the study. However, a larger study would be required to address this issue more comprehensively.

Although the practices that introduced a formulary for NSAIDs were shown to alter their prescribing, it could be argued that the changes were relatively small. There may be a number of reasons for this. First, following discussion with the practices involved in the study, it was evident that few had made attempts to change the medication of patients on repeat prescriptions following the introduction of their formulary. Given that a sizeable proportion of prescribing is by repeat prescription,[23] this factor would reduce the amount of change that one might expect with the introduction of a formulary. Secondly, some of the practices may have been reasonably contented with their NSAID prescribing on reviewing their PACT data. These practices may have decided not to make major changes to their NSAID prescribing with the introduction of a formulary. Thirdly, while the practices were given information on formulary development at the start of the study, they were encouraged to find out for themselves information on rational prescribing for specific therapeutic groups. However, discussions with the study practices revealed that some relied solely on their own knowledge of prescribing when making decisions on items for inclusion on the formulary. This may have made these practices more likely to continue with previous prescribing patterns than to make changes.

Further research

This study has demonstrated the feasibility of conducting a controlled trial to determine the impact of introducing prescribing formularies in general practice. Any future studies need to be large enough to have the power to convincingly confirm or refute the hypotheses being tested. However, it needs to be recognized that formulary development is time-consuming[5] and that practices need to be motivated. Therefore, before conducting a major study, researchers would need to establish that sufficient numbers of practices are prepared to take part.

Conclusion

Following the development of a formulary for NSAIDs, practices prescribed from a narrower range of drugs and they focused a greater proportion of their prescribing on their three most commonly used drugs. This study provides a contribution to the literature that suggests that prescribing formularies in general practice may favourably alter prescribing patterns.

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