The effects of fundholding in general practice on prescribing habits three years after introduction of the scheme

Sarah Stewart-Brown, Rebecca Surender, Jean Bradlow, Angela Coulter, Helen Doll

Abstract

***Objectives*—To observe changes in prescribing practice that occurred after the introduction of fundholding in first wave practices and to contrast these with changes occurring in similar non-fundholding practices.**

***Design*—Prospective observational study.**

***Setting*—Oxford region fundholding study.**

***Subjects*—Eight first wave fundholding practices and five practices that were not interested in fundholding in 1990-1, which were similar in terms of practice size, training status, locality, and urban rural mix. Three of the fundholding and none of the non-fundholding practices were dispensing practices.**

***Main outcome measures*—Changes in prescribing practice as measured by net cost per prescribing unit, cost per item, number of items prescribed, and substitution rates for generic drugs three years after the introduction of fundholding. Data for fundholding practices were analysed separately according to whether they were dispensing or non-dispensing practices.**

***Results*—Prescribing costs rose by a third or more in all types of practice. The patterns of change observed in this cohort after one year of fundholding were reversed. No evidence existed that fundholding had controlled prescribing costs among non-dispensing fundholders; costs among dispensing fundholders rose least, but the differences were small compared with the overall increase in costs.**

***Conclusions*—Early reports of the effectiveness of fundholding in curbing prescribing costs have not been confirmed in this longer term study.**

Health Services Research Unit, Department of Public Health and Primary Care, University of Oxford, Radcliffe Infirmary, Oxford OX2 6HE
Sarah Stewart-Brown, *director*
Rebecca Surender, *research officer*
Helen Doll, *statistician*

Unit of Health Care Epidemiology, Department of Public Health and Primary Care, University of Oxford
Jean Bradlow, *honorary research associate*

King's Fund Centre, London W1M 0AN
Angela Coulter, *director*

Correspondence to:
Dr Stewart-Brown.

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Introduction

The 1991 NHS reforms were introduced to address the problem of escalating NHS costs; prescribing costs constituted an important component of this problem.[1] In the reforms, general practice fundholders were given a drugs budget and the power to reinvest any savings that they could make in other services to their patients. This provided a major incentive to control prescribing costs. At the same time an indicative prescribing scheme was introduced to encourage non-fundholding practices to control costs: a financial target was set for each practice, based on historical prescribing cost data and an estimate of inflation; no formal penalties were imposed on practices that failed to meet their target. Both types of practice were provided with information on their prescribing patterns relative to patterns in other practices. This information made it easier for practices that wanted to reduce their prescribing costs to do so. When the fundholding scheme was introduced the indicative prescribing scheme in non-fundholding practices depended for success on the willingness of general practitioners to prescribe cost effectively; fundholding practices, however, had in addition a financial incentive to reduce prescribing costs; thus it was expected that fundholding practices would be much more successful in controlling drug costs than non-fundholders.

The advent of fundholding and the introduction of the indicative prescribing scheme were not the only factors influencing prescribing patterns at that time. Other factors included marketing pressures from the pharmaceutical industry to prescribe newer, more expensive, and brand name drugs; increased demand from an increasingly well informed public; and the appointment by the family health services authorities of medical and pharmaceutical advisers, whose job was to encourage cost effective prescribing. Further pressures came from professionally led initiatives to improve clinical practice by identifying and treating unrecognised asthma and ensuring the full implementation of preventive measures, such as treating hypertension and giving anticoagulants to those at risk of stroke from atrial fibrillation. The effect of these professional initiatives was enhanced by the introduction of health promotion clinics in the 1991 general practitioner contract, which provided financial incentives to practices to run special clinics to improve treatment for chronic conditions such as hypertension, asthma, and diabetes.

Finally, a different set of incentives continued to operate for practices which had a licence to dispense drugs to their patients. These practices receive a fee of 10·5% on the cost of all drugs dispensed and are also able to retain some of the profits from discounts on drug purchases. Thus they stand to gain financially from increasing the number of prescriptions and prescribing brand name and other more expensive drugs.

The introduction of general practitioner fundholding was a radical experiment in health care provision, and the lack of centrally directed evaluation was striking. Several independent studies, however, observed the changes occurring in fundholding practices and contrasted these changes with those occurring in non-fundholding practices.[2] Initial results from these studies suggested that fundholding was more successful than the indicative prescribing scheme at containing drug costs.[3-5]

We report the prescribing patterns of the practices taking part in the Oxford region fundholding study three years after the introduction of fundholding; we update the data that were published from this study one year into the fundholding project.[4]

Methods

Prescribing analysis and cost (PACT) data were obtained for eight fundholding and five non-fundholding practices for the same six month periods

Table 1—*Net cost (£) per 1000 prescribing units for phases 1 and 3 in three types of general practice, with percentage increases or decreases (95% confidence interval)*

Treatment group	Dispensing fundholders (n=3)			Non-dispensing fundholders (n=5)			Non-fundholders (n=5)		
	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease
Gastrointestinal	1947	2836	45·7 (45·0 to 47·0)	1502	2398	59·6 (59·0 to 61·0)	1824	2790	53·0 (52·2 to 53·7)
Cardiovascular	2903	3274	12·8 (12·1 to 13·4)	3050	3588	17·6 (17·2 to 18·1)	2631	3156	19·9 (19·4 to 20·5)
Respiratory	1962	2528	29·0 (28·0 to 29·7)	2337	3027	29·5 (29·0 to 30·1)	1993	2511	29·9 (29·2 to 30·6)
Central nervous system	1330	2096	57·6 (56·5 to 58·8)	1296	2222	71·5 (71·0 to 72·2)	1401	2057	46·8 (45·9 to 47·7)
Infections	1523	1351	−11·3 (−12·2 to −10·3)	1290	1507	16·8 (16·0 to 17·6)	1401	1607	14·7 (13·9 to 15·6)
Musculoskeletal	1711	1262	−26·2 (−27·1 to −25·4)	1161	1028	−11·5 (−12·2 to −11·1)	1169	1085	−7·2 (−8·0 to −6·3)
Other	4132	7130	72·6 (72·1 to 73·1)	4594	7266	58·2 (58·0 to 58·6)	4467	7366	64·9 (64·5 to 65·1)
Total	15 508	20 477	32·0 (31·7 to 32·4)	15 229	21 035	38·1 (37·8 to 38·3)	14 826	20 571	38·7 (38·5 to 39·0)

Columns do not always sum to total owing to rounding.

Table 2—*Number of items per 1000 prescribing units for phases 1 and 3 in three types of general practice, with percentage increases or decreases (95% confidence interval)*

Treatment group	Dispensing fundholders (n=3)			Non-dispensing fundholders (n=5)			Non-fundholders (n=5)		
	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease
Gastrointestinal	178	215	20·8 (17·9 to 24·3)	156	187	19·9 (17·6 to 22·4)	157	179	14·0 (12·0 to 17·1)
Cardiovascular	361	433	19·9 (17·8 to 22·2)	335	410	22·4 (20·6 to 23·9)	283	344	21·5 (19·3 to 23·3)
Respiratory	207	227	9·7 (7·0 to 12·8)	223	260	16·6 (14·5 to 18·5)	184	211	14·7 (12·0 to 16·7)
Central nervous system	386	413	7·0 (5·0 to 9·1)	327	373	14·1 (12·4 to 15·7)	361	390	8·0 (6·6 to 9·3)
Infections	305	298	−2·3 (−4·5 to −1·4)	319	351	10·0 (8·4 to 11·7)	285	312	9·5 (7·7 to 11·5)
Musculoskeletal	162	155	−4·3 (−7·2 to −1·0)	128	137	7·0 (4·0 to 9·1)	119	127	6·7 (3·6 to 9·6)
Other	665	843	26·8 (25·1 to 28·4)	745	872	17·0 (16·1 to 18·1)	651	760	16·7 (15·4 to 18·0)
Total	2264	2585	14·2 (13·4 to 15·0)	2234	2590	16·0 (15·4 to 16·5)	2041	2323	12·8 (12·1 to 13·4)

Columns do not always sum to total due to rounding.

in the financial years 1990-1 (phase 1), 1991-2 (phase 2), and 1993-4 (phase 3).

These practices had all taken part in the wider Oxford region fundholding study, which compared several different facets of clinical activity in fundholding and non-fundholding practices. The study was established by approaching all the practices in the region that did not want to become fundholders in 1990; of the 11 practices interested in taking part in the study, seven were recruited. The fundholding practices were selected from the pool of first wave fundholders in the region on the basis of similarity to these seven non-fundholding practices in terms of training status, locality, and urban rural mix; 10 were identified. None of the practices received a deprivation allowance.

Two of the original fundholding practices were excluded from this study because their family health services authorities could not supply prescribing analysis and cost data for phase 1 (these practices had also been excluded from the previous report on prescribing in the Oxford region study).[4] This left eight fundholding practices to participate in this study. Two of the non-fundholding practices were excluded from our analysis here because they became third wave fundholders during phase 3. Of the remaining five non-fundholding practices, two became fourth wave fundholders and were therefore in their "shadow" fundholding year during phase 3 of this study.

Three of the eight fundholding practices, but none of the non-fundholding practices, were dispensing practices. Because of the different incentives operating on prescribing habits in these practices, results for the prescribing practices are presented separately.

The total populations covered by the eight fundholding practices and the five non-fundholding practices were 112 514 and 58 360 respectively; list sizes ranged from 10 594 to 24 090 among fundholders and from 6491 to 20 235 among non-fundholders. Seven fundholding and all non-fundholding practices were training practices, and by phase 3 of the study all the practices had computers.

The results are expressed as a six monthly rate per 1000 prescribing units. The prescribing unit is calculated as the number of patients aged ≤ 64 years in the practice plus three times the number of patients aged ≥ 65 years; this measure makes a crude adjustment for variation in prescribing costs owing to differences in the age distribution of practice populations. The significance of changes over the time was measured with 95% confidence intervals for proportions derived by use of the software package CIA.

Results

Tables 1 and 2 show that the net costs of drugs per 1000 prescribing units and the number of items prescribed rose steadily over the three years in all types of practice; net costs rose by a third or more. Between phases 1 and 3 the costs went up least among the dispensing fundholders (32·0%) and most among the non-fundholders (38·7%). In contrast with the changes occurring between phases 1 and 2, however, between phases 2 and 3 both the dispensing and the non-dispensing fundholders increased their prescribing costs much more than the non-fundholders (table 3). As a result, at the end of the study the highest costs were found among the non-dispensing fundholding practices (£21 035); paradoxically this is the group with the greatest incentive to keep costs low and the fewest

perverse incentives to increasing costs. Costs for the non-fundholders and the dispensing fundholders were closely similar (£20 571 and £20 477 respectively).

During the study, changes in prescribing patterns occurred within specific groups of drugs (table 1). In all three types of practice the costs fell for drugs used for musculoskeletal diseases; this was due primarily to a reduced cost per item such as would be achieved by generic substitution and use of cheaper non-steroidal anti-inflammatory drugs rather than fewer prescriptions (tables 2 and 4). The fall in the net cost was greatest among the dispensing fundholders (26%) and smallest among the non-fundholders (7·2%); the dispensing fundholders seemed to make the greatest change in generic substitution for non-steroidal anti-inflammatory drugs (table 5). Because of a high baseline in phase 1, however, the dispensing fundholding practices were still spending more than the other types of practice on drugs for musculoskeletal diseases in phase 3 (table 1).

The only class of drugs on which the dispensing fundholders were spending less than the other types of practice in phase 3 was that used to treat infections (primarily antibiotics)—the dispensing fundholders had reduced costs, whereas the costs in the other types of practice had risen. The reduction was primarily attributable to a reduced average cost (table 4), which could have been achieved by generic substitution, prescription of cheaper antibiotics, or shorter courses of treatment, or a combination of these strategies.

The greatest increases in net costs occurred for drugs used to treat diseases of the central nervous system and gastrointestinal disorders. These changes occurred across all three types of practice. The increase in the costs of drugs for treating diseases of the central nervous system was attributable to an increased cost per item likely to reflect prescribing of the more expensive, new antidepressants—the selective serotonin reuptake inhibitors—rather than an increase in the number of items prescribed (tables 2 and 4). The increase in the cost of drugs for gastrointestinal disorders was attributable to both an increased cost per item (probably owing to the prescribing of the proton pump inhibitor, omeprazole) and an increase in the number of prescriptions. The increase in both these groups of drugs was greatest among the non-dispensing fundholders, consistent with these practices having the greatest overall prescribing costs in phase 3.

All the practices showed an increase in the number of items prescribed; the greatest increase was among non-dispensing fundholders, the least among the non-fundholders (table 2). The latter also started from a lower baseline. Most of this increase was accounted for by an increase in the numbers of items of drugs in the "other" category, but increases in the number of drugs prescribed for cardiovascular disease and for gastrointestinal disorders also contributed. The increase in the number of items of drugs prescribed for cardiovascular disease was partly offset by a reduction in the average cost per item of these drugs (table 4), so the net cost for the non-fundholding practices increased by less than that for other groups of drugs. This reduction in average costs seems to have occurred despite increased prescribing of the more expensive angiotensin converting enzyme inhibitors, presumably offset by reductions in costs of other drugs for cardiovascular disease. Alternatively, dispensing

Table 3—*Net cost (£) per 1000 prescribing units for phases 1, 2, and 3 in three types of general practice, with percentage increases (95% confidence interval) between phases 1 and 2, and 2 and 3*

		Phase 2 (1991-2)		Phase 3 (1993-4)	
	Phase 1 (1990-1)		% Increase or decrease		% Increase or decrease
Dispensing fundholders	15 508	17 093	10·2 (9·9 to 10·5)	20 477	19·8 (19·5 to 20·1)
Non-dispensing fundholders	15 229	17 239	13·2 (13·0 to 13·4)	21 035	22·0 (21·8 to 22·2)
Non-fundholders	14 826	17 945	21·0 (20·8 to 21·3)	20 571	14·6 (14·4 to 14·9)

Table 4—*Average cost (£) per item for phases 1 and 3 in three types of general practice, with percentage increases or decreases (95% confidence interval)*

	Dispensing fundholders (n=3)			Non-dispensing fundholders (n=5)			Non-fundholders (n=5)		
Treatment group	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease	Phase 1 (1990-1)	Phase 3 (1993-4)	% Increase or decrease
Gastrointestinal	10·95	13·17	20·3 (19·4 to 21·2)	9·63	12·81	33·0 (32·0 to 34·0)	11·64	15·55	33·6 (33·0 to 34·2)
Cardiovascular	8·04	7·56	−6·0 (−6·7 to −5·3)	9·10	8·76	−3·7 (−4·2 to −3·3)	9·30	9·19	−1·2 (−2·0 to −1·0)
Respiratory	9·50	11·14	17·3 (16·4 to 18·2)	10·49	11·66	11·2 (11·0 to 12·0)	10·48	11·91	13·6 (13·0 to 14·4)
Central nervous system	3·44	5·07	47·4 (46·2 to 49·0)	3·96	5·95	50·3 (49·5 to 51·3)	3·88	5·27	35·8 (35·1 to 36·9)
Infections	4·99	4·53	−9·2 (−10·3 to −8·3)	4·04	4·29	6·2 (5·4 to 7·0)	4·91	5·14	4·7 (4·0 to 6·0)
Musculoskeletal	10·57	8·13	−23·1 (−24·0 to −22·2)	9·06	7·53	−16·9 (−17·7 to −16·1)	9·82	8·55	−12·9 (−13·7 to −12·1)
Other	6·22	8·46	36·0 (36·0 to 37·0)	6·17	8·33	35·0 (35·0 to 35·5)	6·86	9·69	41·3 (41·0 to 42·0)
Total	6·85	7·92	15·6 (15·3 to 16·0)	6·82	8·12	19·1 (19·0 to 19·4)	7·26	8·94	23·1 (22·9 to 23·2)

Columns do not always sum to total due to rounding.

Table 5—*Proportions (percentages) of generic drugs prescribed, by type of general practice, for phases 1 and 3, with difference in percentage points between these proportions (95% confidence interval)*

	Dispensing fundholders (n=3)			Non-dispensing fundholders (n=5)			Non-fundholders (n=5)		
Treatment group	Phase 1 (1990-1)	Phase 3 (1993-4)	Difference	Phase 1 (1990-1)	Phase 3 (1993-4)	Difference	Phase 1 (1990-1)	Phase 3 (1993-4)	Difference
All drugs	26·9	39·0	12·1 (11·6 to 12·4)	44·5	58·0	13·5 (13·2 to 13·8)	51·3	56·0	4·7 (4·3 to 5·0)
Allopurinol for Zyloric	52·7	92·8	40·1 (35·2 to 45·1)	83·8	96·3	12·5 (9·3 to 16·0)	86·3	95·5	9·2 (6·0 to 13·0)
Naproxen for Naprosyn	13·5	66·0	52·5 (48·2 to 57·0)	64·4	91·2	26·8 (24·0 to 30·0)	65·4	87·4	22·0 (18·4 to 26·0)
Co-trimoxazole for Septrin and Bactrim	5·0	62·2	57·2 (53·0 to 62·0)	58·3	96·9	38·6 (36·2 to 41·0)	71·3	87·0	15·7 (13·0 to 19·0)

fundholders may have prescribed the same drugs for shorter time periods.

Overall, the cost per item increased in all three types of practice (table 4). The increase was greatest among non-fundholding practices, which were also the practices with the highest average cost in phase 3. The combination of high average cost and low number of items in these practices could be due to these practices issuing drugs for longer time periods to patients suffering from chronic diseases.

Both the dispensing and the non-dispensing fundholding practices increased the proportion of generic drugs that they prescribed more than the non-fundholding practices (table 5), but both started from a lower base. During phase 3 the non-dispensing fundholders caught up with the non-fundholders in the overall proportion of generic drugs that they prescribed (58% and 56% respectively), whereas the dispensing fundholders were still lagging behind (39%).

Discussion

When the initial results of this study were published one year after the fundholding scheme was introduced the authors concluded that, as expected, the fundholding scheme seemed to have been more effective than the indicative prescribing scheme in controlling prescribing costs. The type of practices that had reduced costs the most were the dispensing fundholders; the least reductions were seen in non-fundholding practices.

The results presented here three years after the introduction of the scheme suggest that the story is more complicated. By phase 3 (1993-4) the pattern of change had reversed and the differences between the three types of practice had reduced: the non-dispensing fundholders had caught up with the non-fundholders and were again spending more on drugs than the non-fundholders. The fundholders had increased their rate of generic substitution more than non-fundholders but only to the extent that in 1993-4 they were both prescribing generic drugs at a similar rate. Thus conclusions drawn from studying the first year of fundholding seem to have been premature.

DISPENSING FUNDHOLDERS

One of the more intriguing findings reported in this paper is the difference between the dispensing and the non-dispensing fundholding practices. Dispensing fundholders have a financial incentive to prescribe drugs in smaller packages with more repeat prescriptions. They also stand to gain by prescribing more costly drugs and are subject to more marketing pressures from the pharmaceutical industry. At the beginning of the study these practices were spending the most on prescribing; at the end, however, they were spending less than non-dispensing fundholders and the same amount as non-fundholders. If these changes are attributed to fundholding it could be concluded that fundholding controls prescribing costs only among dispensing practices. General practitioners working in dispensing practices are likely to be better informed than those in non-dispensing practices, and this may have enabled the former practices to respond more effectively to fundholding. Apart from this, there do not seem to be any plausible hypotheses to explain these findings, and as no dispensing non-fundholding practices took part in the study we may have observed the effects of an unrelated phenomenon occurring in dispensing practices at that time.

POSSIBLE EXPLANATIONS

For both fundholding and non-fundholding practices our results are compatible with the hypothesis that the latter artificially increased their prescribing costs in phase 1 (their preparatory year) and that the changes observed in phases 2 and 3 simply brought these practices back towards their original position in the league table of costs. Also, practices that prescribed generic drugs at a low rate may have kept these rates artificially low in the preparatory year, sensing that this would make it easier to make a profit from fundholding. Lack of prescribing analysis and cost data from earlier years makes it difficult to refute these possibilities. Alternatively, fundholders may have achieved all the savings that they could make by the end of phase 2 and had less scope to make cost effective changes to prescribing practice in phase 3 than the non-fundholders. The fact that the dispensing fundholding practices had not achieved the substitution rates for generic drugs achieved by the other practices makes this unlikely.

Other possible explanations exist for our findings, some of which are methodological and some of which reflect other changes that were occurring in the health service at the time of the study. This study was an observational one that aimed to throw light on the effect of an unevaluated political experiment; it was not a controlled trial. Fundholders and non-fundholders were selected for study because they were similar in terms of practice size, location, population prosperity, urban rural mix, and training status; they must have differed in other respects. Although the number of prescriptions recorded in the study is large and the results are therefore highly significant, the number of practices we observed was quite small statistically. So the results may not be generalisable to all types of practice.

The methods that were used to compare prescribing costs are the best that were available at the time the study was set up; new measures—such as the age, sex, and temporary resident originated prescribing unit (ASTRO-PU)[6]—which control more effectively for demographic differences between practices were not available then. As all the practices in this study had relatively stable populations, changes in population structure are most unlikely to be responsible for the changes in prescribing that we observed. The defined daily dose is a better measure of the volume of drugs prescribed than the measure we used (number of items per prescribing unit),[5] but as it does not reflect the costs of drugs—the principal target of the reforms—it was not appropriate for use in this study.

Incentive schemes to encourage non-fundholders to reduce prescribing costs became more realistic in 1993-4; practices were allowed to keep between 20% and 50% of their savings against their indicative prescribing limit, depending on their prescribing costs in the previous year, up to a maximum of £2500 per general practitioner. None of the practices in the Oxford region participated in an incentive scheme in 1990-1; but in 1993-4 many participated and many benefited. Thus the lower rate of increase among non-fundholders in phase 3 could be attributable to a greater financial incentive to control costs. Alternatively the two non-fundholding practices that were in their preparatory year for the fourth wave of fundholding in 1993-4 could have started to reduce their prescribing costs from September 1993 onwards (after the time period on which their fundholding drugs budget would be based) in preparation for fundholding.

OVERALL INCREASE IN DRUG COSTS

Perhaps the most important message from these data is that any possible effect of fundholding on prescribing costs in either dispensing or non-dispensing practices was very small compared with the increase that has taken place in all three types of practice over

the study period. The inflationary influences on prescribing costs discussed in the introduction have been more important than all of the cost control influences (of which fundholding was only one) combined. The effect of marketing pressure from the pharmaceutical industry is probably the most powerful of these influences; it is discernible in this study in the increase in cost per item of drugs for diseases of the central nervous system and for gastrointestinal disorders. No clinical research evidence exists that either the expensive selective serotonin reuptake inhibitor antidepressants or the new proton pump inhibitor omeprazole are more effective than the previous generation of drugs,[7] but heavy marketing pressure has led to an increase in prescribing.

Increasing drug costs are not necessarily a bad thing. Both the Health of the Nation strategy and professional audits call for an increase in prescribing in certain areas of clinical practice. The mental health component of the Health of the Nation calls for an increase in the detection and treatment of depression in primary care; the heart disease component calls for an increase in the detection and treatment of hypertension. Both professional pressure and the financial incentives offered to practices to establish chronic disease management clinics were intended to improve the management of both asthmatic and diabetic patients. These clinics, together with a more active system of case finding, were bound to lead to an increased number of patients being treated. In addition, pharmaceutical companies are continually bringing new drugs on to the market, some of which have important therapeutic benefits that outweigh the increased costs—for example, angiotensin converting enzyme inhibitors for heart failure and sumatriptan for migraine. All these changes are likely to bring about cost effective improvements in health.

The reasons that fundholding seems not to have had the effect on prescribing costs that was predicted still have to be defined. Financial incentives provided by either fundholding or indicative prescribing schemes may never be sufficiently powerful to influence clinical practice; more sophisticated measures may be necessary. Or maybe we are being premature in seeking to identify the effect of these incentives. The cultural change required of doctors to achieve any form of cost containment may take a long time to manifest itself.

Key messages

- Early reports from observational studies set up to evaluate the effects of fundholding suggested that fundholding practices had been more successful than non-fundholders in controlling prescribing costs
- The first year results from one of these studies, the Oxford region fundholding study, have not been borne out over a longer period
- The differences in prescribing costs between fundholders and non-fundholders three years after the introduction of fundholding were small compared with the overall increase in prescribing costs
- In 1993-4 non-dispensing fundholders spent more on drugs than other types of practice
- Fundholding may have been more successful in controlling costs among dispensing fundholders than among non-dispensing practices

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Characteristics of general practices that prescribe appropriately for asthma

Patricia Sturdy, Jeannette Naish, Filomena Pereira, Chris Griffiths, Susan Dolan, Peter Toon, Mike Chambers

We have previously found that the ratio of prophylactic to bronchodilator prescriptions is a crude indicator of appropriate prescribing for asthma.[1] In this study we explored the possible influence of the general practitioner, the practice, and the practice population on this ratio.

Methods and results

Complete data sets were obtained for 150 of the 163 practices in east London for April 1992 to March 1993. Their asthma prescribing patterns have been described elsewhere.[1] The 23 predictor variables selected for the analyses are listed in the table; detailed descriptions are available from the authors. The outcome variables were the ratio of prophylactic drugs to bronchodilators prescribed measured as both items and net ingredient cost (logarithm of ratio). Two models were constructed by stepwise multiple linear regression analysis with backward elimination of variables. A significance level of 0·05 was used to determine variables staying in the model. The resulting regression models (see table) show that 31% of the variability in the prescribing ratio measured as items was accounted for by average age of the principals, the presence of a trainer, and the proportion of the list aged over 65, while 33% of the variability in the ratio when measured as net ingredient cost was accounted for by average age of the principals, nursing hours available in the practice, and the presence of a practice manager.

Correspondence to:
Dr Naish.

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