

# Prescribing costs and patterns of prescribing in general practice

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**SUMMARY.** Prescriptions issued by 14 general practitioners during December 1974 were examined to elicit possible determinants of differences in doctors' prescribing costs per registered patient. Higher costs were associated with a generally increased prescribing rate but differences were particularly marked for certain drug groups (such as anti-rheumatic drugs). Costs were not related to list size, size of practice unit, urbanization, proportion of elderly patients, or date of qualification of the doctor, and the cost differences were too large to be accounted for by differences in morbidity. The frequency of prescription of drugs considered to be undesirable was also not associated with level of costs.

An index of quality of prescribing was constructed. No relationship was found between scores on this index and any of the practice variables studied, nor was there any relationship with high-cost prescribers.

### Introduction

**P**RESCRIBING behaviour has been recently and more extensively reviewed elsewhere (Taylor, 1977). Previous studies (Benjamin and Ash, 1964; Lee *et al.*, 1964) have detected large differences in prescribing frequency and cost between doctors. In an attempt to discover why some doctors appear to prescribe more expensively than others, this preliminary study examines the relationship of levels of prescribing cost to:

1. Characteristics of doctors and their practices.
2. Overall prescribing frequency and quantity.
3. Frequency of prescription of drugs considered to be undesirable.
4. Cost of prescription of individual drug groups.

### Methods

The therapeutic category, quantity, and net ingredient cost of NHS prescriptions signed by 14 experienced principals during December 1974 were extracted from the prescription forms, and details of doctors and their practices were obtained. (Where necessary, list size and proportion of elderly patients were calculated on an average-per-partner basis.)

#### *Characteristics of doctors and practices*

The relationship of the doctors' average net ingredient costs of prescribing per NHS patient to the following factors was examined:

1. Duration of professional qualification of doctor.
2. NHS list size.
3. Proportion of patients over 65 years of age.
4. Total list size of practice (as an indication of size of practice unit).
5. Total population of main area served (as an indication of the degree of urbanization of the area).

The doctors were arranged in rank order for each variable and Spearman's Rank Correlation Coefficient was calculated for each possible association and significance tests carried out.

#### *General characteristics of prescribing*

Similar correlation calculations were completed for the relationship of cost per patient to the following:

1. Average prescribing frequency per 1,000 patients on list.
2. Average quantity of drug prescribed per 1,000 patients on list.
3. Average cost per prescription.
4. Average quantity per prescription.
5. Average cost per unit quantity of drug issued.
6. Average proportion of prescriptions written in proprietary form.

The calculations involving quantity relate only to orally administered tablets, capsules and liquids which constituted, on average, 85 per cent of all prescriptions. One tablet/capsule was equated with 5 ml of liquid but the chosen unit of equation is relatively unimportant, as even on this basis (which errs on the side of overestimating liquid units) oral liquids accounted for only 16 per cent of total units.

*Index of prescribing quality*

The quality of prescribing is difficult to assess on the basis of information from prescriptions alone, but some drugs (e.g. amphetamines) are widely agreed to be undesirable, whereas others (e.g. barbiturates, anabolic steroids) might be regarded as appropriate only in strictly limited circumstances. A list of drugs in these and intermediate categories was constructed after reference to sources such as the *British National Formulary*, *Prescribers' Journal*, *MIMS* and various textbooks of therapeutics. A summary of the types of drug included is given in Appendix 1 and a detailed list may be obtained from the author.

It is postulated that, although many of them are in legitimate everyday use, high proportionate prescribing of these drugs in relation to that of colleagues might be an indication of at least one aspect of prescribing quality. A score was calculated for each doctor based on the proportion of total prescriptions issued for these drugs, weighted according to the estimated degree of undesirability. Thus, for example, a weighting of four was applied to prescriptions for amphetamine, as against one for topical antihistamines. Using the methods previously described, correlations were then calculated between this score and all the personal, practice, and general prescribing variables previously mentioned, including average net ingredient cost per patient.

*Individual drug groups*

Differences in the prescribing of particular drug categories were examined by dividing the doctors into two equal groups, the highest and lowest seven doctors for prescribing ingredient cost per registered NHS patient. (The mean, median, and range of values of this variable are given in Table 1.) For each separately coded therapeutic category the average cost per 1,000 patients incurred by each group of doctors was calculated and the difference in cost between the groups obtained.

**Results**

A total of 15,865 prescriptions were issued on the numbered pads of the 14 doctors but only those 12,572 (79 per cent) which had been signed by the doctors concerned were studied (the rest having been signed by other doctors on their behalf).

Table 1 summarizes some general results and shows, for example, that the mean and median values for various measures of prescribing cost, frequency, and

**Table 1.** Distribution of 14 urban doctors for various measures of prescribing cost, frequency, and quantity (December 1974).

	Mean	Median	Range
Number of prescriptions per person on list	0.45	0.47	0.25-0.65
Total net ingredient cost of prescriptions (£)	690	623	286-1,424
Average net ingredient cost per person on list (£)	0.36	0.33	0.21-0.66
Average quantity per person on list* (units)	25	25	14-42
Average ingredient cost per 100 units of quantity* (£)	1.18	1.19	1.00-1.43
Percentage proprietary/total prescriptions	78	79.5	62-89

\*See text.

quantity are very similar, indicating that the distribution curves are unlikely to be abnormally skewed.

*Relationship of prescribing costs to personal and practice factors*

There was no significant correlation of prescribing ingredient cost per person on list with any of the personal or practice factors previously listed.

*Relationship of prescribing costs to general characteristics of prescribing*

There was a highly significant ( $p < 0.01$ ) correlation of increased costs with increased number of prescriptions and quantity of drug issued per person on list, indicating that increased costs are largely incurred by more frequent prescribing per head of population. At a somewhat lower level of significance ( $p < 0.05$ ) there was an association between increased cost per person and increased average cost of drugs per 100 units of quantity, indicating that the prescription of more expensive drugs is also an important factor. There were no other significant correlations.

*Index of undesirable drugs*

There were no significant correlations between the index score and any of the personal, practice, or general prescribing factors previously listed. It is perhaps particularly interesting that there was no correlation between this crude measure of prescribing quality and those of prescribing cost.

*Differences in prescribing of individual drug categories*

By grouping the 14 doctors into two equal groups on the basis of each doctor's average net ingredient cost per 1,000 patients, the difference in prescribing costs between the higher (A) and lower (B) cost groups of doctors for each individual drug category was ascertained. Such cost differences were not, of course, evenly distributed, but were dependent on the frequency of prescription and the cost per unit quantity of drugs in each group. In order to avoid spurious differences, due to a small number of highly expensive prescriptions (e.g. insulins, trophic hormones), infrequently prescribed drug groups (arbitrarily defined as those with a total of fewer than four prescriptions per 1,000 patients per month) are excluded from the analyses presented here. Although the *MIMS* classification is given to aid identification of specific drug groups, correspondence between this and the classification in this study is inexact.

There were no instances in which the lower cost (B) doctors had higher costs for an individual drug category than the higher cost (A) group. Table 2 shows the 12 categories for which the cost excess per 1,000 patients of group A over group B doctors was greatest. The 12 drug groups represent 68 per cent of all prescriptions and 70 per cent of total cost. Not only are there large variations in the degree of cost difference (from almost two and a

half times for anti-rheumatic drugs and almost double for anti-anginal drugs, including all beta-blockers, to 43 per cent for alimentary drugs and 23 per cent for anti-asthmatic drugs) but there are large variations in the composition of cost differences relative to the two determining factors—volume of prescribing and average unit cost of prescribed drugs.

Thus the large difference in cost of anti-rheumatic drugs is almost wholly accounted for by increased volume of prescribing on the part of the higher cost doctors, whereas the prescription of more expensive drugs (i.e. higher average unit cost) accounts for nearly two thirds of the cost difference for sedative preparations. With cough remedies, hypnotics and anti-asthmatic drugs, the lower cost group of doctors prescribed more expensive preparations on average, although the differences were small. However, the higher cost group still incurred higher total costs because of their greater volume of prescribing.

**Discussion**

As a crude illustration of the degree of variation in individual prescribing costs, extrapolation of these results demonstrates that the estimated total annual prescription (net ingredient) cost per 1,000 patients is £2,500 for the lowest cost doctor in the study as against £8,000 for the highest cost doctor.

There are, of course, inadequacies of method in

**Table 2.** Cost analysis of those drug categories showing the 12 largest differences in prescribing cost per 1,000 patients between high (A) and low (B) cost groups of doctors.

	Cost (per 1,000 patients)		Quantity (per 1,000 patients)		Cost difference (per 1,000 patients) (£)	Percentage of excess costs accounted for by greater average unit cost of drugs prescribed	
	A (£)	B (£)	A (units)	B (units)		%	(£ amount)
(7A/B)* Antibacterial	64.50	37.50	2,137	1,354	27.00	19	(5.25)
(4A) Anti-rheumatic	30.71	9.26	1,142	349	21.45	2	(0.48)
(2B) Anti-anginal**	25.57	8.53	1,465	534	17.04	nil	
(2D) Anti-hypertensive	27.00	13.01	1,433	727	13.99	7	(0.98)
(3A) Analgesic***	25.21	13.09	3,540	2,038	12.12	20	(2.45)
(9C) Cough remedies	23.93	13.24	3,122	1,379	10.69	nil	
(5B) Diuretic	24.93	15.88	1,532	1,130	9.05	37	(3.30)
(3C) Sedative	17.64	8.97	2,993	2,188	8.67	62	(5.40)
(3B) Hypnotic	17.50	10.96	1,551	946	6.54	nil	
(3D) Anti-depressant	12.50	6.84	863	507	5.66	17	(0.95)
(9B) Anti-asthmatic	25.63	20.67	—	—	4.96	—	
(i) tabs/liquids	(9.14)	(6.82)	(862 )	(575 )	(2.32)	nil	
(ii) inhalers	(7.75)	(5.92)	( 6.4 )	( 5.0 )	(1.83)	13	(0.24)
(iii) 'Intal' spincaps	(8.74)	(7.93)	(161 )	(145 )	(0.81)	nil	
(1A/B) Alimentary	16.00	11.18	1,772	1,436	4.82	44	(2.14)

\*The approximate corresponding *MIMS* category (e.g. 7A/B) is given in parenthesis.

\*\*All beta-blocking drugs available at the time of the study were classed with anti-anginal drugs.

\*\*\*Aspirin and derivatives were classified with other analgesic drugs.

retrospective work of this kind in partnership practices, principally relating to the use of mean list size as an indirect indicator of workload, the inability to distinguish new from repeat prescriptions, and possible variations in the use of each partner's individually numbered pad. Nevertheless, such substantial cost differences are unlikely to be largely due to these factors. In particular, the variations in cost differences for different drug categories warrant further study.

It is conceivable, for example, that the cost difference (Table 2) between higher and lower cost doctors of 23 per cent for anti-asthmatic drugs might be due to differences in morbidity or anomalies of method, but the cost difference of nearly two and a half times for anti-rheumatic drugs is unlikely to be similarly accounted for and suggests possible differences between the doctors in their range of indications for the use of these drugs.

What is the importance of the differences between high and low cost doctors in the average unit cost of drugs prescribed? Extrapolating from these findings, the cost difference attributable to higher average unit cost of preparations prescribed within the drug categories listed in Table 2 amounts to £500 per doctor per year (12 per cent) between the higher and lower cost groups of doctors. This difference could represent a difference in the cost of prescription of equivalent drugs (e.g. different brands of analgesic) or alternatively a difference in the prescription of non-equivalent drugs with different unit cost included in the same drug category (e.g. glyceryl trinitrate *versus* beta-blockers). The fact that the percentage excess cost accounted for by greater unit cost is highest for sedatives, where preparations are perhaps more likely to be equivalent, suggests that the former explanation is more likely.

Lastly, it must not be assumed that higher prescribing cost necessarily implies excessive or incorrect prescribing. By limiting prescribing to cheap preparations and prescribing as infrequently as possible, an individual doctor could substantially reduce his costs. However, many undesirable, ineffective, or obsolete preparations (e.g. barbiturates, tonics, digitalis leaf) are amongst the cheapest drugs in terms of unit cost, and most of the drugs which have constituted important recent advances in therapeutics (e.g. disodium cromoglycate ('Intal'), beta-blockers) are amongst the most expensive. It is therefore possible that it is the doctor with the lowest costs who is failing to make available to his patients the full advantages of modern therapeutics. In so far as the Drug Index can be taken to be a measurement of a less satisfactory aspect of prescribing, the fact that no cost/quality association was found supports the contention that the prescribing of higher cost prescribers is not poorer in quality. Furthermore, the Index includes the majority of drugs thought to have particularly undesirable adverse effects and the findings also suggest that awareness of such effects is no less amongst low than amongst high cost doctors.

Equally, it cannot be said that those drug categories where large cost differences occur between doctors necessarily represent instances where economies might be made.

The importance of cost differences may lie, therefore, not in their economic significance, but in the insights which cost analysis may give into patterns of prescribing and how these are influenced. In particular it might be expected that the effect of commercial drug promotion might be reflected in cost differences between doctors. Studies of cost may help to elicit these relationships.

**Appendix 1: An index of prescribing quality.**

*Key to therapeutic categories*

- (a) Use of drug should be strictly limited because of undesirable potential effects or consequence.
- (b) Particularly undesirable drug combination—dosage of each drug usually warrants separate control.
- (c) Considered to be
  - (i) justifiably obsolete
  - (ii) of very dubious efficacy.

	Category
<i>Group 1</i>	
(Weighting = x1)	
e.g. Topical antihistamines	a
Topical neomycin	a
<i>Group 2</i>	
(Weighting = x2)	
e.g. Tonics, appetite stimulators	c (ii)
Vitamins	c (ii)
Iron + vitamins	c (ii)
Thyroid, liver extracts	c (i)
Digitalis leaf	c (i)
<i>Group 3</i>	
(Weighting = x3)	
e.g. Anabolic steroids	a
Appetite suppressants	a
Barbiturates (alone or in combination)	a, b
Mercurial diuretics	c (i)
Iron + more than 0.5 mg folic acid	b
Rauwolfia + anti-anginal drugs	b
Phenylbutazone (or oxyphenbutazone) alone	a
Antidiarrhoeal + antibiotic	b
<i>Group 4</i>	
(Weighting = x4)	
e.g. Amphetamines (alone or in combination)	a
Methaqualone (alone or in combination)	a
(Systemic) chloramphenicol (alone or in combination)	a
Phenacetin (alone or in combination)	a
Phenylbutazone (and oxyphenbutazone) in combination with other drugs (e.g. steroids, analgesics)	b

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### Thoughts from the 'thirties

Teaching and examining are today exclusively in the hands of specialists who, almost without exception, have no experience of general practice. Yet they presume to teach the necessary qualifications and to examine for this, the keystone of all medical service. It is a notorious fact that the student who has passed his examinations is not qualified thereby to practise the art of medicine; he has to learn this *after* he has "satisfied the examiners". Would the walls of the universities of Jericho fall if it was suggested that general practitioners might again take a large share in the training and examining of the students who are to be general practitioners, as they did before the specialists assumed a superiority complex and the conduct of all affairs of education? The calling of a general practitioner should not be saddled with an inferiority complex and regarded as the refuge of the destitute; it should attract the best men and it should again take its rightful place of honour. I believe the change could be made and it would be alike to the great benefit of the student and to the prestige of the medical practitioner in the eyes of a critical public that senses, even if it does not analyse, the present trend of affairs.

To attach a number of general practitioners to the medical school and to give them definite standing and teaching facilities would have a marked effect in fitting the student for the difficulties and responsibilities of practice. Moreover it would certainly tend to raise and maintain the standards of general practice that, thanks to the Insurance Act and other causes, have lost so much in the last decades. The lure of being connected with a medical school and of having just a little of the responsibility of teaching would quickly attract a body of men of the right type to any school that had the courage and the inspiration to work out a scheme on these lines.

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