

Change in the established prescribing habits of general practitioners: an analysis of initial prescriptions in general practice

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SUMMARY. *The aim of this study was to describe the types of drugs prescribed by general practitioners in a sample of initial (rather than repeat) prescriptions, the additions and deletions made to a doctor's repertory and the factors influencing these changes.*

The method used here enabled repeat prescriptions to be excluded as these are an inaccurate reflection of the current habits of the prescriber. A total of 201 (74%) of the principal general practitioners in the Grampian region participated. Data were obtained by substituting special prescription pads containing duplicate forms which allowed additional data to be recorded at the time of prescribing, including perceived influences that had resulted in changes from established choices of drug therapy. A sample of 100 forms were collected on seven occasions from each doctor over a one year sample period. Prescribers on average selected a preparation that they had only started to use within the last 12 months (that is newly adopted to their repertory) in 5.4% of initial prescriptions. These changes mostly involved antibiotics and analgesics and were occasioned mainly by the influence of the 'limited list' regulations, pharmaceutical company representatives and hospital specialists. We conclude that general practitioners were not unduly influenced by commercial sources of information, and that their prescribing habits were stable and conservative. The paper presents a case for the separate analysis of initial and repeat prescriptions as an essential step in producing more informative data on prescribing.

Introduction

It has been shown that from the extensive range of available preparations, general practitioners tend to work from a restricted personal repertory of medicines when prescribing.¹ The prescriber's current repertory is not, however, necessarily reflected in every prescription that he or she signs; this is so particularly in the case of repeat prescriptions, which may include therapies initiated by other prescribers. The doctor's repertory is reflected most accurately by the prescriptions which he initiates (initial prescriptions).

Previous studies of prescribing have mostly depended on the analysis of dispensed prescriptions² for which no distinction can be made between initial and repeat prescriptions.³ Fraser and colleagues⁴ were able to differentiate between prescriptions issued at consultations and those issued without the patient being seen by a doctor. Although this is a useful distinction, it still includes repeat prescriptions issued at consultations.

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Several studies on drug innovation and influences on doctors' prescribing were carried out in the late 1960s and early 1970s.^{5,6} These studies showed that doctors went through two stages in adopting a new drug to their repertory: information gathering (mostly from commercial sources) and evaluation (largely dependent on professional communications). While important, these studies were primarily sociological studies which looked at the mechanism of innovation and were based either on the recall of use of one or two specified newly marketed drugs, or on linkage of overall prescribing of a drug with other characteristics.

The aim of this study was to describe the types of drugs prescribed by general practitioners in a large sample of initial prescriptions, the additions and deletions made to a doctor's repertory and the factors influencing these changes.

Method

Following pilot studies, special prescription pads containing 50 standard GP10 forms, with interleaved duplicates, were produced through Her Majesty's Stationery Office. The duplicate forms obliterated the patient's name and address to preserve anonymity, and provided for the recording of extra information relating to each item. Initial prescriptions were defined as those intended either as a complete course of treatment (for example an antibiotic for an acute condition) or the first in a series of prescriptions for the same drug (for example an antihypertensive prescribed either for a newly diagnosed patient or as an addition to, or replacement for, existing treatment).

The prescriber was asked to classify each initial prescription item by encircling 'E', 'N', or 'S' on the duplicate form according to the following definitions: established (E) for a drug habitually selected as first or second line treatment for a given diagnosis; newly adopted (N) for a drug added to the doctor's personal repertory during the previous 12 months, although not necessarily a newly marketed drug; superseded (S) for a drug which during the previous 12 months had been removed from the general practitioner's personal repertory but for various reasons, for example pressure from the patient, was still being prescribed.

Where a change in prescribing habit had occurred ('N' or 'S'), the doctor was asked to indicate the major influence(s) perceived as underlying this change, for example pharmaceutical company representative, hospital doctor, generic prescribing policy, and any drug displaced as a consequence.

Of all 281 unrestricted principals in the Grampian region, 212 (75%) agreed to take part in the study. Doctors who participated in the study included a slight excess of those who were more recently qualified, and those who had the MRCGP, but there were no differences between participants and non-participants in respect of geographical location, sex, number of partners or number of postgraduate qualifications.

Each doctor completed one sample of 100 consecutive prescription forms at surgery consultations (approximating to between one and two weeks' work) every seven and a half weeks over a one year period, commencing June/July 1985. A method of time sampling was used to limit the effects of seasonal variation in morbidity; over the one year study period, every week was sampled by approximately 25% of the study doctors. The

small number of 'first' prescriptions written during home visits were excluded.

Of the 212 doctors entering the study, only those 189 (89% of the original sample) who completed five or more of the seven possible sample periods, were included in our analyses. Those who did not complete our required minimum of five samples withdrew mainly because of illness or retirement.

The drugs prescribed were categorized according to the therapeutic groups in the *British national formulary*.

Results

Proportion of initial prescriptions

Initial prescription items constituted 62.3% of all 161 266 prescription items written at surgery consultations, the remainder representing repeat items written during consultations (rather than via receptionists for later collection).

Size of repertory and current initial prescribing pattern

More than 1000 different preparations were prescribed, but 41 of these accounted for 51.3% of all prescriptions. Individual doctors prescribed between 100 and 200 different preparations each (mean 144, median 145, 99% confidence intervals: 137; 151). Appendix 1 shows the five most frequently prescribed preparations in each therapeutic category of the *British national formulary* with generic and proprietary forms differentiated, expressed as rate of prescribing per 1000 initial prescriptions. The 15 preparations most frequently prescribed overall are ranked as shown.

New additions to repertory

The proportion of drugs added to doctors' repertories was low; for the 189 doctors the mean proportion of newly adopted items was only 5.4% of all initial prescription items and the median was 3.5%. A new drug was specified as displacing an established drug in 42.0% of these cases of new prescribing. A further mean of 0.9% of items were classified as 'superseded' by the doctors, that is, items ousted from their repertory although still occasionally prescribed. Table 1 shows an analysis of initial, established, newly adopted, and superseded preparations by therapeutic group with, for comparison, similar data for all (that is both initial and repeat) dispensed prescriptions in Scotland

over the same 12 month period July 1985 to June 1986. Closer inspection of the frequencies with which individual drugs were prescribed showed that most changes in the central nervous system category were due to changes among the analgesics, sometimes in name only (for example, *Distalgesic* to coproxamol). The changes in the cardiovascular group were mostly among antihypertensive drugs.

Table 2 shows the 15 drugs most frequently added to repertories, and the preparations which were most frequently displaced as a consequence. Changes occasioned by the then recently imposed limitations on drugs which could be prescribed under the NHS (the 'limited list') are excluded from Table 2.

Influences on change in repertory

Although the forms allowed for two influences to be cited for each change of prescribing, in fact most of the participants only

Table 2. Fifteen most frequently prescribed newly adopted preparations (excluding changes enforced by the 'limited list' regulations).

Newly adopted drugs	No. of newly adopted items prescribed	No. of doctors using drug	Drug most frequently displaced
<i>Augmentin</i>	96	44	<i>Amoxil</i>
<i>Canesten</i>	91	35	(various)
<i>Triludan</i>	71	34	<i>Piriton</i>
Cotrimoxazole	53	13	<i>Septrin</i>
<i>Canesten HC</i>	48	21	<i>Nystaform HC</i>
<i>Erythrocin</i>	46	29	<i>Erythroped</i>
<i>Gynopevaryl</i>	45	19	<i>Canesten</i>
<i>Pulmicort</i>	44	35	<i>Becloforte</i>
<i>Hismanal</i>	44	26	<i>Piriton</i>
<i>Fenopron</i>	42	18	(various)
<i>Zovirax</i>	41	32	<i>Herpid</i>
<i>Surgam</i>	41	21	<i>Synflex</i>
Erythromycin	41	20	Penicillin V
<i>Difflam</i>	41	21	<i>Oraldene</i>
<i>Voltarol</i>	40	30	<i>Indocid</i>

Table 1. Analysis of initial prescriptions by therapeutic category and doctor's classification.

BNF category	Percentage of total items prescribed				Percentage of all Scottish first and repeat items ^a (n = 3574 x 10 ⁴)
	All initial items (n = 99 646)	Established items (n = 93 373)	Newly adopted items (n = 5353)	Superseded items (n = 920)	
Gastrointestinal	6.8	6.7	9.1	10.2	9.2
Cardiovascular	4.0	3.6	6.9	5.9	18.8
Respiratory	10.9	10.7	12.9	16.7	11.1
Central nervous system	11.0	10.4	17.5	20.0	20.4
Infections	32.6	34.1	16.3	18.5	13.7
Endocrine system	1.3	1.2	2.4	1.0	5.5
Obstetrics, gynaecology, urinary tract disorders	2.6	2.6	3.4	3.5	0.9
Malignant disease	0.1	0.1	1.2	0.0	0.2
Nutrition and blood	2.1	2.1	3.9	3.5	2.9
Musculoskeletal	7.7	8.0	7.7	8.7	6.6
Eye	2.7	3.0	0.9	0.7	2.5
Ear, nose, oropharynx	3.3	3.3	3.8	4.0	1.1
Skin	14.7	14.0	13.5	7.3	7.1
Vaccine	0.2	0.2	0.5	0.0	0.0

^aFigures for July 1985 to June 1986 inclusive supplied by Information and Statistics Division, Scottish Home and Health Department.

specified one. In over 60% of 6273 changes (that is initial prescriptions categorized as newly adopted or superseded, rather than established), the major influences perceived by the prescribers were the limited list regulations, pharmaceutical company representatives and hospital doctors (Table 3), while the *Monthly index of medical specialities*, and the *British national formulary* were among the least frequent of the 27 influences specified by respondents. Hospital doctors influenced the largest number of preparations and affected mostly drugs prescribed less than five times, but the limited list regulations and pharmaceutical company representatives influenced a smaller number of drugs and those prescribed more often (Figure 1). The drugs most influenced by the pharmaceutical company representatives were anti-infective preparations and non-steroidal anti-inflammatory agents. The five drugs most prescribed as a result of limited list regulations were codydramol, coproxamol, cocodamol, *Sudafed* and pholcodine.

Generic prescribing

Thirty five per cent of all initial prescriptions were prescribed generically.

Discussion

Our data defines the current habits of prescribers by describing only newly initiated prescriptions. Prescriptions which are being repeated are an inaccurate reflection of the current habits of the prescriber, because they may have been initiated by other prescribers or at a time when older habits prevailed. A measure of the difference between total and initial prescriptions may be estimated from a comparison of our figures with the Scottish figures (based on all dispensed prescriptions) for the same time interval. There was great variation in, for instance, the prescriptions for cardiovascular and central nervous systems problems, which predominate in the overall Scottish figures, and for the skin problems and antibiotics which are more prominent in initial prescribing. As a measure of the change in habit caused by the actual participation in the study, that is, would doctors

Table 3. Doctors' perceptions of major influence on changes in prescribing, that is on prescriptions classed as newly adopted or superseded.

Influence	Total number (%) of times mentioned
'Limited list' regulations	1559 (25.2)
Pharmaceutical company representative	1235 (20.0)
Hospital doctor	1092 (17.6)
General practitioner	364 (5.9)
Patient	312 (4.8)
Preference for generic prescribing	297 (5.0)
Cost	242 (3.9)
Mailing/advertisements	224 (3.6)
Adverse drug reaction	129 (2.1)
<i>Monthly index of medical specialities</i>	120 (1.9)
<i>British national formulary</i>	110 (1.8)
Other (miscellaneous)	511 (8.3)
Total	6195 (100.0)

NB: Doctors could mention up to two influences for each preparation.

change their prescribing in some way because they were being monitored, we also look at the relative proportions of different antibiotics prescribed within the category for the treatment of infections. The prescribing of the doctors in this study approximated well to overall Scottish prescribing in this group.

Changes in prescribing habit over the year occurred in a very small proportion of the initial prescription items; newly adopted items formed only a mean of 5.4% (median 3.5%) of all initial items, one quarter of which could be attributed to the 'limited list' regulations. Only 42% of these newly initiated prescriptions appeared to have displaced another drug. This confirms Mapes' view⁷ that innovations in drug therapy do not necessarily replace an existing treatment, and that preparations fall into disuse by professional consensus. Only 0.9% of items were classified as superseded. According to the definition of 'superseded' given to the study doctors, this would be a prescription

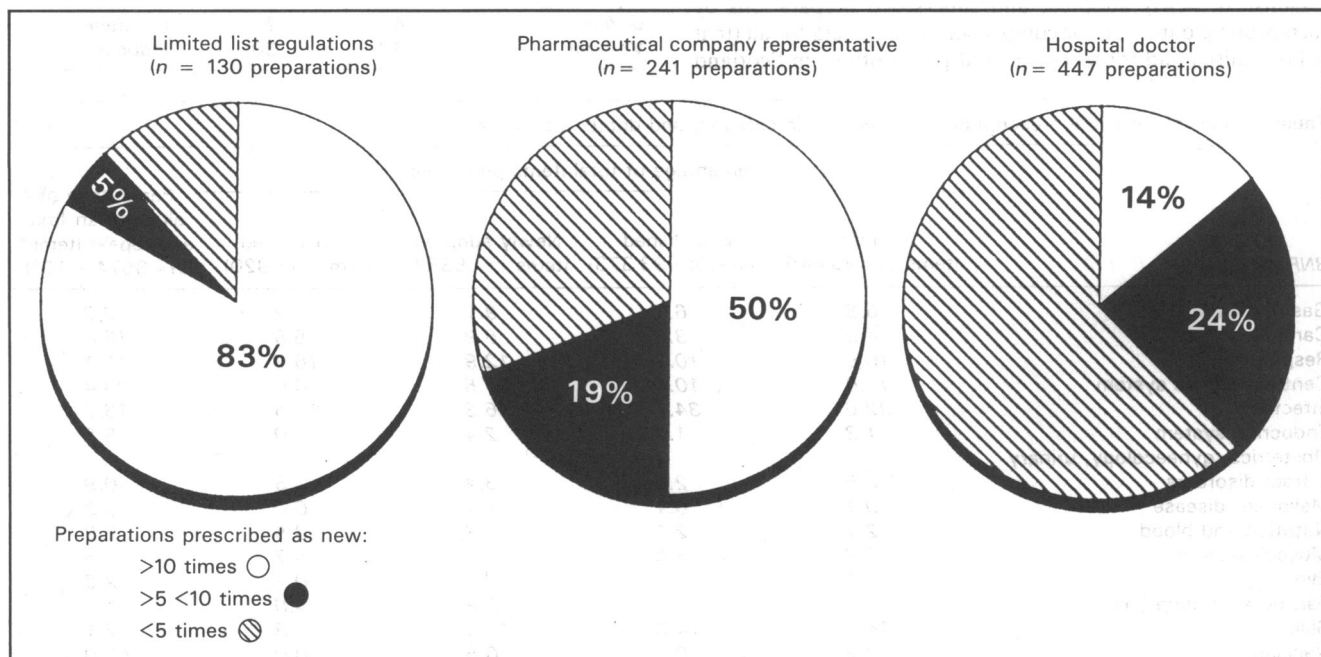


Figure 1. Effect of three different types of influence on prescribing according to frequency of prescription of drug (NB: doctors could mention up to two influences on each preparation).

which the doctor would prefer not to have written, and it is reassuring that these represent such a small proportion of total newly initiated prescriptions.

Prescribing data for the Grampian region (personal communication, Prescription Pricing Division, Common Services Agency, Aberdeen), shows that over the same 12 month period each general practitioner prescribed on average 248 items per working week (allowing for holidays); from our data, an estimated 149 items (60%) would have been issued at consultation,⁴ of which 93 items would have been initial prescriptions. Three of the 93 items (but only two different preparations) would have been new adoptions to his or her repertory.

The relative proportions of the therapeutic groups in analyses of initial prescriptions were not reflected in the newly adopted prescriptions. In particular, drugs acting on the nervous and gastrointestinal systems were over-represented as initial prescriptions because of the mandatory changes under the 'limited list' regulations. Further examination of the classification 'central nervous system' showed that antidepressant and antihistamine prescriptions remained fairly constant and that the changes were among the analgesics. In the cardiovascular group, also disproportionately over-represented in 'new' prescribing, most changes were for drugs for hypertension, and this reflects the current high rate of introduction of new preparations in this field. Apart from these categories, most individual changes were made in the treatment of infections, although overall this group was under-represented in newly adopted prescriptions. *Augmentin* was the most commonly adopted drug, being identified as newly adopted in 96 instances, possibly reflecting the positive contribution of this drug to the choice of first line antibiotic treatments.

Substitution of generic for brand name preparations accounted for only 5% of changes, although a previous survey of Scottish principals⁸ showed considerable support for increased generic prescribing. Overall, 35% of all initial prescription items were prescribed generically, a figure much in agreement with the 37% of all prescriptions reported by the National Prescription Research Centre for 1987.⁹ One possible explanation for the small change attributable to generic prescribing is that these doctors were already relatively high generic prescribers (generic prescribing doubled between 1982¹⁰ and 1988⁹ in the UK); alternatively, ideological support for generic prescribing may not be reflected in practice.

Excluding the 'limited list' regulations, many changes could be attributed to the influence of pharmaceutical company representatives, particularly in the case of broad spectrum antibiotics and analgesics (therapies mostly initiated in general practice). However, a large number of changes in prescribing were also due to the influence of hospital doctors. Peay and Peay¹¹ showed that pharmaceutical company representatives were the most important influence causing doctors to adopt a new drug (temazepam). Our study shows that the contribution of the two major influences on general practitioners (pharmaceutical company representative and hospital doctor) differed according to the nature of the drug in question. Many doctors could be influenced by the pharmaceutical company representative to prescribe a drug for short-term use, such as an antibiotic, but changes in selection of therapies for possible long-term use, such as antihypertensive drugs, may not be perceived as being attributable to the representative's influence. This is compatible with the work of Williamson,¹² who showed that influences on prescribing were dependent on the perceived therapeutic risk of the drug in question. Of course, hospital doctors themselves are influenced by a spectrum of factors, some of which will be commercial; however this study looked only at direct influences on the general practitioner. In contrast to the influence of phar-

maceutical company representatives, that of hospital doctors affected a far greater number of preparations so that this was the most important factor contributing to the size of drug repertories. This suggests that hospital medicine would be the key factor in any attempt to rationalize prescribing through the use of practice or regional formularies.

Finally, although the project was not primarily designed to provide individual feedback, personal prescribing details were supplied to the 138 doctors who indicated their interest. They were sent itemized lists of all their initial, newly adopted and superseded items, together with overall results. Doctors were generally interested and frequently surprised at the difference between actual and recalled prescribing habits.

Review of prescribing habits has in the past depended on feedback about actual prescribing habits from dispensed prescriptions.² The computerization of prescription pricing with PACT (prescribing analyses and cost) and SPA (Scottish prescribing analysis) has now largely resolved the logistical problem of providing such feedback on a national scale. But how useful are these data? In special studies, Taylor¹³⁻¹⁵ has shown that these relatively crude data can be surprisingly informative, and even allow primitive but useful qualitative judgements to be made. With little additional effort, available data could be made more sensitive by using different prescription pads,¹⁶ which allow for, for example, the division of prescriptions into initial and repeat categories. Repeat prescribing is by definition, relatively static (although it should certainly be subject to frequent and rigorous review). Initial prescribing is, in contrast, the dynamic element of prescribing; it is here that new patterns and future trends will be identified. Our paper presents a case for the separate analysis of initial and repeat prescriptions as an essential step in producing more informative feedback.

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Appendix 1. Top five preparations in each therapeutic category that were issued as initial prescription items together with the top 15 preparations overall ($n = 99\,646$).

BNF category	Drug name	No. of initial items prescribed	No. of initial items presented per 1000 initial items (rank)
Gastrointestinal	<i>Gaviscon</i>	713	7.2
	<i>Colofac</i>	525	5.3
	<i>Maalox</i>	504	5.1
	<i>Proctosedyl</i> ^a	391	3.9
	Cimetidine	390	3.9
Cardiovascular	Bendrofluazide	229	2.3
	<i>Navidrex K</i>	222	2.2
	Atenolol	213	2.1
	Glyceril trinitrate	189	1.9
	Propranolol	178	1.8
Respiratory	<i>Sudafed</i>	3221	32.6 (3)
	Pholcodine linctus	1024	10.3
	<i>Triludan</i>	912	9.2
	<i>Ventolin</i>	837	8.4
	Codeine linctus	571	5.8
Central nervous system	Codydramol	1245	12.6 (15)
	Coproxamol	882	8.9
	Diazepam	751	7.6
	Temazepam	668	6.7
	<i>Stemetil</i>	515	5.2
Infections	<i>Amoxil</i>	5390	54.4 (1)
	Penicillin V	4108	41.4 (2)
	Erythromycin	2385	24.0 (4)
	<i>Erythrocin</i>	2235	22.5 (5)
	Ampicillin	2039	20.6 (6)
	(<i>Septin</i>)	1772	17.5 (8)
	(<i>Vibramycin</i>)	1286	12.0 (12)
(Oxytetracycline)	1185	13.1 (14)	
Endocrine system	Prednisolone	397	4.0
	<i>Primolut N</i>	222	2.2
	<i>Duphaston</i>	100	1.0
	Thyroxine	70	0.7
	Depomedrone	58	0.6
Obstetrics, gynaecology, and urinary tract disorders	<i>Marvelon</i>	372	3.8
	<i>Logynon</i>	340	3.4
	<i>Microgynon</i>	288	2.9
	<i>Ovranelle</i>	152	1.5
	<i>Trinovum</i>	128	1.3
Malignant disease ^b	Tamoxifen	20	0.2
	<i>Nolvadex</i>	9	0.09
	Azathioprine	5	0.05
	Stilboestrol	3	0.03
Nutrition and blood	Ferrous sulphate	312	3.2
	<i>Ferrogradumet</i>	187	1.8
	<i>Dioralyte</i>	148	1.5
	Vitamin B6	144	1.4
	<i>Rehidrat</i>	127	1.3
Musculoskeletal	<i>Ponstan</i>	1648	16.6 (9)
	<i>Naprosyn</i>	1546	15.6 (10)
	<i>Brufen</i>	588	5.9
	<i>Voltarol</i>	521	5.3
	Ibuprofen	493	4.9
Eye ^a	<i>Chloromycetin</i>	1226	12.4 (13)
	Chloramphenicol	873	8.8
	<i>Betnesol</i>	120	1.2
	Hypromellose	116	1.2
	<i>Betnesol N</i>	107	1.1

Ear, nose and oropharynx ^a	Xylometazoline	413	4.2
	Ephedrine (topical)	382	3.9
	<i>Corlan</i>	346	3.5
	<i>Otosporin</i>	277	2.8
	<i>Sofradex</i>	259	2.6
Skin ^a	Canesten	1900	19.2 (7)
	Hydrocortisone	1428	14.4 (11)
	Betnovate	842	8.5
	<i>Daktacort</i>	741	7.5
	<i>Propaderm</i>	647	6.5

^aAll these preparations were primarily or wholly for topical use. ^bNo fifth item in this category. n = number of items, excluding the 816 unclassifiable or 'missing data' items.

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