A year's study of drug prescribing in general practice using computer-assisted records

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SUMMARY. A year's drug prescribing by five family doctors working in a new town is reviewed. The records were computerised and some of the problems which this involved are mentioned.

The range of different preparations which were used over the year was high but 76 per cent of prescriptions were accounted for by 117 preparations; 30 per cent of total prescribing was for antibiotics and psychotropic drugs. The lessons to be learned from ' self-audit ' have been shown and areas for future study are discussed.

Introduction

The annual cost of drugs is increasing and in 1971 accounted for about 12–14 per cent of National Health Service expenditure in Scotland. In the same year the cost of drugs prescribed by general practitioners was approaching £20 million with hospital prescribing costs accounting for a further six million pounds. The Department of Health reported in 1973 that the number of prescriptions issued by general practitioners in England and Wales increased by 30 per cent between 1963 and 1971 while the total cost of National Health Service prescriptions from general practitioners more than doubled.

Spiralling drug costs demand a greater degree of control than was desirable or practicable in the past, and so it was decided to use the Livingston computer-assisted medical record system to analyse a year's drug prescriptions issued by five doctors.

Sources and methods

The Livingston Health Services experiment has been fully described by Duncan (1969). In 1971 there were five practitioners at Craigshill Health Centre, the first of the health centres in the town. The mid-year practice population was 8,290, the age-sex distribution being outlined in figure 1. The population is young with about 40 per cent under 15 years of age and less than ten per cent over 45 years of age. The large doctor-patient ratio is because the general practitioners in Livingston have a restricted list and hold a five-session medical-assistant appointment in a hospital specialty. A description of the Craigshill Health Centre practice has been outlined by Bain (1973).

Figure 1
AGE-SEX DISTRIBUTION OF PRACTICE 1971
NUMBER OF PATIENTS IN PRACTICE—8290

Age	*0–4*	*5–14*	*15–29*	*30–44*	*45–59*	*60–74*	*75+*	*Total*
Male	624	1011	1101	987	295	77	25	4120
Female	646	922	1337	859	274	96	36	4170
Total	1270	1933	2438	1846	569	173	61	8290

Some information from each doctor-patient contact is transferred to the computer and this includes diagnosis, which is coded by using the *International Classification of*

Age		*Number in each age group (* = 25 individuals)*
0–4	Male	*************************
	Female	**************************
5–14	Male	***************************************
	Female	************************************
15–29	Male	***
	Female	**
30–44	Male	**************************************
	Female	*********************************
45–59	Male	************
	Female	************
60–74	Male	***
	Female	****
75+	Male	*
	Female	*

Diseases (WHO, 1967), and treatment. The Department of Health and Social Security drug index was used during the period under survey for coding drug treatment.

The scheme for computer-assisted medical records has been described by Gruer and Heasman (1970). For the year 1971 computer printouts giving all diagnoses and drug prescriptions were produced for the five doctors in the practice.

The pharmacological index in MIMS (1972) was used to classify the drugs. The computer also identified those drugs which were issued as repeat prescriptions. For the purposes of this study no attempt was made to distinguish between " drugs " and " compounds " and drug preparations were classified by the principal component of the preparation concerned. A prescription was taken to be an individual item prescribed for a patient, and no information recorded about the amount of the drug prescribed. The results are therefore a measurement of prescriptions issued.

Results

Table 1 shows the consultations and consultation rates for the whole practice by disease groups (*I.C.D.*) for the year 1971. Respiratory illnesses and mental disorders were the illnesses most frequently diagnosed. Symptoms and ill-defined conditions accounted for nearly ten per cent of all illnesses. In addition, an " X " classification is used and this is a supplementary classification for cases not covered by the *ICD* and the majority of these were for contraceptive advice. Table 2 gives an analysis of the prescriptions by therapeutic categories (*MIMS* classification), and the ' ranking order ' for the practice.

Drugs acting on infections, the central nervous system, and psychotropic drugs were the most commonly prescribed preparations, and there were no major differences between doctors as far as ' ranking order ' is concerned. The five doctors wrote 17,705 prescriptions and table 3 shows the number of prescriptions and consultations for individual doctors.

Table 4 shows the number of preparations used by each doctor and also the number of preparations which were used on only one occasion. The group as a whole used 564 separate preparations; only 58 of these were prescribed by the generic name alone. The main reason was that coding was carried out by secretaries and it was considered easier to dictate proprietary names. The range of different preparations given by individual doctors was from 328 in the case of doctor A to 297 for doctor E; 115 preparations were used by the practice on one occasion only.

Table 5 shows the drugs that were most frequently prescribed and no attempt has been made in this table to distinguish between proprietary and generic names. This small group of drugs accounted for 33·5 per cent of the total prescriptions issued in the

TABLE 1

CONSULTATIONS 1971

I.C.D. No.	*Disease groups*	*Total consultations*	*Percentage of total consultations*
001–136	Infective	1,770	*7·17*
140–239	Neoplasms	92	*0·37*
240–279	Endocrine/nutritional	560	*2·26*
280–289	Blood	322	*1·30*
290–315	Mental disorders	2,698	*10·93*
320–389	Nervous system	1,542	*6·25*
390–458	Circulatory	924	*3·75*
460–519	Respiratory	4,523	*18·33*
520–577	Digestive system	1,228	*4·97*
580–629	Genitourinary	1,827	*7·40*
630–678	Complications of pregnancy	141	*0·57*
680–709	Skin	1,535	*6·22*
710–738	Musculoskeletal	1,040	*4·21*
740–759	Congenital anomalies	94	*0·38*
760–779	Perinatal morbidity	30	*0·12*
780–796	Symptoms, ill-defined	2,416	*9·79*
E800–999	Accidents	1,149	*4·65*
N800–999	Violence	6	*0·02*
	Supplementary ('X' classification)	2,774	*11·24*
	All diseases	24,671	*100*

TABLE 2

DRUG CATEGORIES AND RANK FOR THE PRACTICE

Drug categories (MIMS classification)	*Number of prescriptions*	*per cent*	*Rank*
Alimentary system	1,372	*7·7*	6
Cardiovascular system	304	*1·7*	11
Central nervous system			
Psychotropic drugs	2,583	*14·6*	3
Other CNS drugs (inc. analgesics, anti-convulstants, antihistamines)	2,644	*14·9*	2
Ear, nose and oropharynx	1,155	*6·5*	8
Endocrines	290	*1·6*	13
Genitourinary system	562	*3·2*	10
Infections	2,852	*16·1*	1 } **97·1%* antibiotics
Nutrition and metabolism	871	*4·9*	9
Respiratory system	1,596	*9·0*	5
Ophthalmic drugs	300	*1·7*	12
Dermatological preparations	1,657	*9·4*	4
Contraceptives	1,335	*7·5*	7 } **93·6%* Oral contraceptives
Miscellaneous (diagnostic agents, dressings, antiseptics	184	*1·0*	14
Total prescriptions	17,705	100%	

TABLE 3
CONSULTATIONS AND DRUG PRESCRIBING—1971

Doctor	*List size (1 July 1971)*	*Total consultations*	*Drug prescriptions*
A	1,619	5,493	4,302
B	1,532	3,250	2,244
C	1,684	4,787	3,280
D	1,715	5,470	3,512
E	1,740	5,671	4,367
Total practice	8,290	24,671	17,705

TABLE 4
DRUG PREPARATIONS (SINGLE DRUGS + COMPOUNDS)

Doctor	*Number of preparations*	*Preparations prescribed once only*
A	328	92
B	305	88
C	308	74
D	320	75
E	297	72
The practice	564	115

TABLE 5
FREQUENCY OF COMMONLY PRESCRIBED DRUGS

	Drug preparations	*Number of prescriptions*	*Per cent*
1.	Penicillin V preparations ('Penicillin V', 'V cil K', ' Crystapen V ', ' Distaquine V ')	947	*15·9*
2.	Diazepam (' Valium ')	783	*13·2*
3.	Ampicillin (' Penbritin ')	603	*10·2*
4.	' Otrivine ' (spray + drops)	587	*9·9*
5.	' Penidural '	547	*8·7*
6.	' Actifed ', ' Actifed Co ' (tabs + linctus)	518	*8·4*
7.	Betamethasone/' Betnovate ' skin preparations	498	*6·3*
8.	Codeine linctus	376	*4·8*
9.	Nitrazepam ('Mogadon')	283	*4·7*
10.	Oxytetracycline ('Terramycin')	282	*4·5*
11.	' Triominic ' (Tabs and Syrup)	265	*4·2*
12.	' Gynovlar 21 '	251	*4·0*
		5,940	*100*

year; 76 per cent of all prescriptions issued during 1971 were accounted for by 117 preparations.

Over 30 per cent of our total prescribing was for antibiotics (16 per cent) and psychotropic drugs (14·6 per cent). Five preparations ' Penicillin V ', ampicillin, ' Penidural ', oxytetracycline, ' Septrin ', contributed 86·2 per cent of all antibiotics prescribed. A further 20 preparations contributed to 13·8 per cent and prescriptions for sulphonamides only numbered 55 (1·9 per cent of drugs acting on infections).

Psychotropic drugs were subdivided into four categories—tranquillisers, hypnotics,

antidepressants, and appetite suppressants (*MIMS* classification, 1972), and table 6 gives the number of prescriptions in each category.

TABLE 6
PSYCHOTROPIC DRUG PRESCRIPTIONS

Category	*Number of prescriptions*	*Per cent*
Tranquillisers	1,410	*54·6*
Antidepressants	590	*22·8*
Hypnotics	477	*18·5*
Appetite suppressants	106	*4·1*
Total	2,583	*100*

There were 1,410 prescriptions given for tranquillisers and diazepam accounted for 55·5 per cent of these, while four drugs—diazepam, chlordiazepoxide, chlorpromazine and meprobamate—accounted for 87 per cent of tranquilliser prescribing. Imiprimine, trimipramine, nortryptiline and amitryptiline, accounted for 96·6 per cent of antidepressant prescribing. The most commonly used hypnotic was nitrazepam (Mogadon) (59·9 per cent) while 67 per cent of appetite suppressant prescriptions were for ' Ponderax.'

For drugs acting on the central nervous system other than psychotropic drugs, (phenobarbitone was here considered as an anticonvulsant), there were 2,644 prescriptions, of these analgesics and anti-inflammatory agents accounting for 1,262 (47·7per cent) anti-histamines and anti-emetics, 1,814 prescriptions (44·8 per cent) anti-convulsants and other drugs acting on the C.N.S. accounting for the remainder.

The figures for drugs acting on the respiratory system and alimentary system were as follows:

(1) Respiratory system—596 prescriptions—with three drugs, ' Actifed Co ' Linct., ' Linct. codeine, and ' Alupent ' accounting for 80 per cent of all prescriptions in this group.

(2) Alimentary system—1,372 prescriptions—with three drugs, Mist. kaolin and morphine, Mist. magnesium trisilicate, and ' Aludrox ' accounting for 52 per cent of all prescriptions in this group.

Table 7 shows the number of repeat prescriptions issued by the group as a whole and the drug categories (*MIMS* classification, 1972) for which these prescriptions were issued. There were 2,205 repeat prescriptions (12·5 per cent of all prescriptions) in 1971. Psychotropic drugs accounted for 22·5 per cent of all repeat prescriptions, contraceptive agents (98 per cent oral contraceptives) accounting for 14·7 per cent, drugs acting on the C.N.S. (other than psychotropics) accounted for 12·6 per cent and dermatological preparations 10·4 per cent. Antibiotics were rarely given as repeat prescriptions.

Discussion

The stimulus behind this outline of drug prescribing sprang from one of the stated aims of the computerised medical records system in Livingston New Town: " The computer can be used for evaluation of all aspects of the doctors' work. The value of the computer is that by virtue of its selective capacity it is able to scan the data on its files and act as a rapid index to those parts of the manual record to which the doctor may wish to gain access and which, without its help, would involve doctors in a laborious and often fruitless search." (Scottish Home and Health Department, 1971).

The computer system provides a tabulation of drug use for the practice and each doctor. This information allows the doctor to look at the total spectrum of his drug use and compare it with those of his colleagues. In such a way he can carry out a critical self-audit of prescribing habits and hopefully effect changes.

TABLE 7
REPEAT PRESCRIPTIONS FOR THE PRACTICE
Drug categories (MIMS classification)

	Alimentary system	Cardiovascular system	Central Nervous System: Psychotropic drugs	Central Nervous System: Other CNS drugs analgesics anticonvulsants antihistamines etc.	Ear, nose and oropharynx	Endocrines	Genitourinary system	Infections	Nutrition and metabolism	Respiratory system	Ophthalmic drugs	Dermatological preparations	Contraceptive agents	Miscellaneous (Diagnostic agents, dressings, antiseptics etc.)	TOTAL
Number of prescriptions	133	94	497	278	18	57	93	85	150	199	21	230	325	25	2205
Per cent	*6*	*4·3*	*22·5*	*12·6*	*0·8*	*2·6*	*4·2*	*3·9*	*6·8*	*9*	*1*	*10·4*	*14·7*	*1·1*	*100*
Rank	7	8	1	3	14	11	9	10	6	5	13	4	2	12	

* *98%* Anti-biotics

* *96%* Oral contraceptives

This idea is useful but the interpretation of coded computer information is often complicated as well as laborious, because the 12,711 drugs in the Department of Health and Social Security Drug Index, although comprehensive, are listed randomly. Using the Aberdeen Drug and Medicine Information Nomeclature (A.D.M.I.N.) allows drugs to be coded in terms of their therapeutic function and could solve some of these difficulties: programming the computer to print the drug name against the code number is a better solution for the user.

There is an important aspect of computer recording which must not be forgotten. A system whereby doctors are responsible for recording all information on drug prescribing is wholly dependent on the discipline of the doctors involved. Similarly, secretaries transcribing doctors' dictation for computer purposes must be fully conversant with the system. It must not be forgotten that sophisticated recording techniques do not necessarily improve results and a recent editorial in the *Journal of the Royal College of General Practitioners* has stressed the simplicity of using carbon copies of general practitioners prescriptions (*Journal of the Royal College of General Practitioners*, 1973).

The drug prescribing in our group has demonstrated to individual doctors their prescribing habits and an important finding of our 1971 survey was the large number of drugs prescribed by the group and by individuals. Individual doctors prescribed between 297 and 328 different preparations, and 115 preparations were prescribed on only one occasion by the group as a whole, while individuals varied between 72 and 92 drugs prescribed on only one occasion.

Berkeley (1973) in a study of 12 general practitioners recording drugs prescribed on 26 randomly selected days, found that 401 different drugs were prescribed by this group and individuals ranged from 84 to 175 different drugs. The range of drugs in Livingston is considerably larger than Berkeley's findings, but there are probably two reasons for this—firstly, the Livingston study was over a whole year and secondly it is our impression that a significant percentage of patients in a new town have been prescribed drugs by former practitioners and Livingston doctors may have continued the treatment. Patients, today, are extremely mobile and tend to have several different general practitioners in a relatively short period of time, and inevitably many of these doctors have different approaches to therapeutics.

A small group of 12 drugs (table 5) accounted for a relatively large percentage (33·5 per cent) of all prescriptions issued. The fact that penicillin preparations and diazepam ' Valium ' were the most commonly used drugs can be compared to the morbidity findings in the practice where respiratory tract infections and the large percentage occurring in young children, were the most common group of diseases, with psychiatric disorders being the next most common group of illnesses. In Livingston 16 per cent of prescriptions were for antibiotics and 14·6 per cent for psychotropic drugs: a similar computer-assisted study in America—Stolley *et al.* (1970) reported that 15 per cent of prescriptions were for antibiotics and 17 per cent for psychotropic drugs.

For antibiotic prescribing, it was perhaps reassuring that despite the bombardment by drug firms, ' Penicillin V ' was still the most commonly prescribed antibiotic. More exotic antibiotics accounted for only a very small percentage of our antibiotic prescribing. However, the results we have obtained have made us think more critically of our approach to prescribing antibiotics. A notable result in the survey is the finding that only 1·9 per cent of all prescriptions for drugs acting on infections were for sulphonamides. Dunlop (1952) in his survey of drug prescribing in Scotland found that sulphonamides accounted for 41 per cent of drugs acting on infection at that time. This certainly emphasises the change in prescribing habits over a comparatively short period of time.

The psychotropic drugs that were used were mainly accounted for by the diazepines (chlordiazepoxide, diazepam and nitrazepam), the tricyclic antidepressants and the

phenothazines, while mono-amine-oxidase inhibitors were rarely used. A further study of psychotropic drug prescribing, which takes into account the age and sex of the patient is now being undertaken.

In this study dermatological preparations were responsible for the largest range of drug preparations used by the doctors. The multiplicity of dermatological preparations, some of dubious value, overwhelm the uninitiated, and the duplication under many brand names adds to the confusion. The same comments can be applied to our findings for prescribing in the gastrointestinal disorders, drugs acting on the respiratory system and drugs (other than psychotropics) acting on the central nervous system. With the large percentage of children in this practice it was probably unavoidable that a large number of remedies were issued for minor upper respiratory tract infections and gastro-intestinal upsets.

Repeat prescriptions in Livingston accounted for 12·5 per cent of all prescriptions during one year. Psychotropic drugs were the most common type of drug issued as a repeat prescription and oral contraceptives were a close second. Balint *et al.* (1970) have made an excellent review of repeat prescribing in general practice and it is our intention to look more closely at our repeat prescribing as we consider that in a new town setting it may not be typical of other areas.

This account is a preliminary investigation and the computer system has the main advantage in that there is opportunity to identify the patients and conditions for which certain commonly used drugs are prescribed. General practitioners are becoming more aware of their responsibilities in prescribing, but the reasons behind their use of drugs has often been inadequately studied.

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