to the medical register, and it was noted whether each doctor was in a single or multiple practice. Of the three groups, it was found that the most recently qualified doctors used the *B.N.F.* and discussions with medical colleagues as their therapeutic sources to a greater extent and information derived from the pharmaceutical industry to a less extent than their colleagues in the older age-groups. Doctors in the oldest age-group relied upon consultant advice and discussion with medical colleagues least of the age-groups. Doctors in single practice tended to use consultant advice and the B.N.F. more than their colleagues in multiple practice, but they depended less on discussion with medical colleagues for their therapeutic information. Practitioners in multiple practices relied to the larger extent on the pharmaceutical industry. In both types of practice the proportion of the information derived from the *B.N.F.* and the pharmaceutical industry together was the same.

Medical training, the pharmaceutical industry, the *B.N.F.*, and consultants were each employed to provide over 20% of the information which general practitioners needed for treating their patients. The influence of these sources of therapeutic information was most pronounced in the case of medical training, which was used for treating 95% of all diseases in their patients. Information from the drug industry was used for 60% of the diseases. The *B.N.F.* and consultant advice were used to any significant extent for treatment of only 20% and 15% of the diseases. It is clear that principals in general practice make extensive use of their early medical education in therapeutics, although this training is not always comprehensive enough for the treatment of several conditions. In general practice, doctors select from the information which is available for treatment of their patients, and their therapeutic knowledge is augmented from those sources which are most readily available to them in their surgeries.

We should like to express our grateful thanks to the general practitioners who took part for their interest and helpful co-operation in all parts of the investigation, and for the time they set aside for completing the forms. We should also like to acknowledge the interest, advice, and encouragement afforded to us by the Liverpool and North Wales Faculty of the College of General Practitioners, and by the Research Committee of the College. We are particularly indebted to Dr. T. Eimerl for his help in preparing the diagnosis-therapeutic source forms. Mr. Doncaster and the medical subcommittee of the Liverpool Executive Council gave us valuable support and advice which was very much appreciated. The investigation has been assisted by a grant from the Nuffield Provincial Hospitals' Trust.

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PATTERN OF PRESCRIBING IN GENERAL PRACTICE

BY

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In a previous paper we (Wilson, Banks, Mapes, and Korte, 1963) described how the influence of different sources of therapeutic information could be measured and be related to the prescribing of a group of general practitioners in the Liverpool Executive Council area. After deciding upon their diagnoses, the doctors indicated from what source they drew their therapeutic knowledge when writing an item on a prescription. A form was provided for this purpose. Thirty-nine doctors were asked to do this during every surgery for a week at the end of January or during the first half of February in 1962. The present report presents the results of a second study carried out in October, 1962.

In the previous paper the importance of the different sources of knowledge was discussed in relation to the treatment of the diseases which the doctors diagnosed. In the present report figures have been obtained from the forms filled in by the doctors who took part in both studies in order to ascertain the relative importance of the different sources of therapeutic knowledge on their prescribing during these two seasons of the year. Other investigators have reported on the diagnoses made in general practice in different areas during particular periods (Backett, Shaw, and Evans, 1953 ; Backett, Heady, and Evans, 1954 ; Bloor, 1962 ; Eimerl, 1962 ; Research Committee of the Council of the College of General Practitioners, 1962), but there does not appear to be any published information about the incidence of disease in the same practices at different times during the year. The value of such temporal comparisons is pointed out in this paper, and the conclusions which can be drawn from them about the pattern of prescribing in general practice are discussed.

Procedure in the Investigation

This investigation was carried out with the co-operation of the same group of doctors and in the same way as the investigation previously described (Wilson *et al.*, 1963).

Thirty-two of the original 39 doctors took part in the second investigation, which was carried out in the early autumn of 1962, during the first three weeks of October. Of the seven doctors who were not included, two did not return their forms, two had left the area, and three could not participate because they were on holiday during the period of the investigation. Twenty-five of the doctors in the second investigation were in partnership and seven were in practice by themselves. The representative nature of the inquiry was not affected by the loss of these seven doctors, since the age and sex distributions of the remainder were still typical of the doctors in the Liverpool Executive Council area.

Results of the Investigation

There was no significant difference in the number of items written under the diagnoses during each of the three weekly periods in the autumn. The numbers of items prescribed for the different conditions are compared for February and October in Table I. There are significant differences in numbers recorded under the various diagnoses

in each season. During February bronchitis and associated infective conditions in the middle ear and tonsils were more common. There was an outbreak of influenza in Liver-

TABLE I.—*Numbers of Items Prescribed in February and October*

	Total February	Total October
Tonsils to trachea	374	288*
Otitis media	146	100*
Nasopharynx, coryza, etc.	701	757*
Bronchitis	726	459*
Chronic bronchitis, emphysema	336	286
Pneumonia, pleurisy	30	23
Heart disease	196	194
Hypertension, nephritis	130	136
Varicose veins, phlebitis	26	29
Alimentary infections	159	211*
Peptic ulcer, dyspepsia	253	261
Anaemia	161	173
Influenza	371	104*
Acute specific fevers	24	37
Skin: sepsis	199	191
Skin: other	302	370*
Genito-urinary, male and female	165	164
Pregnancy; natal, pre-, post-	177	146
Rheumatism, neuralgia, fibrositis	357	367
Arthritis, joint injury	141	156
Neuroses, functional disease	406	429
Psychoses, schizoid, depression	102	94
Injuries and sequelae	95	58
Total	5,577	5,033

* Comparison between proportions (February and October) reveal significant differences in the number of items written at a value of $P<0.05$.

pool in February, but it is interesting to observe that even in October the figure for the diagnosis of influenza was high; it was 28% of the February value. In October the incidence of non-infective skin diseases, diseases in the nasopharynx, and alimentary infections was significantly higher.

Percentage Use of Therapeutic Sources in February and October

A comparison of the extent to which the doctors used the different therapeutic sources during the two periods of the investigation is shown in Table II. There was no

TABLE II.—*Percentage Use of Therapeutic Sources in February and October*

Source of Therapeutic Knowledge	February	October
Medical training	33·1	30·8
Consultant advice	9·2	10·4
Textbooks	2·0	0·9*
Periodical medical journals and articles	5·9	4·3
British National Formulary	15·4	13·1*
Prescribers' Journal	0·6	2·0*
Monthly Index of Medical Specialities	3·8	2·2*
Drug firms (advertisements and representatives)	25·7	30·6*
Discussion with G.P. colleagues	4·4	5·8

Homogeneous Distribution Comparisons. No significant difference in rank order of distribution of use of sources in February and October (Spearman test, $P=0.05$).

Individual Item Comparisons. Significant differences between use of individual therapeutic sources are shown by an asterisk. Differences are significant at $P=0.01$, and are calculated on numbers of items prescribed by doctors common to both investigations.

significant difference in the rank order of the distribution of the sources in February and October, just as there was no significant difference in their distribution during the three separate weekly periods in February (Wilson *et al.*, 1963). This indicates that the doctors tended to use their sources of therapeutic information according to the same general pattern throughout the seasons of the year, although use of the individual therapeutic sources varied to some extent, depending upon the incidence of disease and the doctors' available time during the different seasons. It can be seen from Table II that the doctors used the pharmaceutical industry as a source of knowledge more and the *British National Formulary* and textbooks significantly less during the early autumn. In October, 1962, the tenth number of the *Prescribers' Journal* appeared; by this time sufficient numbers had been published for it to have made an impression, and the general practitioners were using it as a source of therapeutic knowledge significantly more than in February, when only five numbers had appeared.

Percentage Use of Therapeutic Sources in Respect of Date of Medical Registration

The use of the different therapeutic sources in February and October has been compared according to the dates on which the doctors were admitted to the *Medical Register*. In Table III the rank order of distribution of use of the sources has been compared for February and October among the doctors of the different age-groups. It can be seen that the relative use of the therapeutic sources did not

TABLE III.—*Percentage Use of Therapeutic Sources According to Time of Medical Registration: Homogeneous Distribution Comparisons*

Source of Therapeutic Knowledge	Percentage Source Used					
	Pre-1940 Group		1940–50 Group		Post-1950 Group	
	Feb.	Oct.	Feb.	Oct.	Feb.	Oct.
Medical training	32·7	29·7	30·6	23·1	35·9	6·1
Consultant advice	5·9	7·1	11·2	11·3	11·5	13·5
Textbooks	3·3	0·1	1·0	0·9	1·2	0·9
Periodicals	5·5	3·8	7·7	5·8	4·9	3·9
B.N.F.	14·9	13·9	14·6	14·3	16·6	12·0
Prescribers' Journal	0·5	3·7	0·6	1·3	0·6	1·0
M.I.M.S.	4·4	2·3	6·4	4·5	0·7	0·3
Drug firms	30·4	36·6	25·0	35·7	20·2	21·5
Discussion with colleagues	2·3	2·2	2·9	3·0	8·4	10·8

Pre-1940 February and October, Post-1950 February and October: Significantly homogeneous. (Spearman test, $P=0.05$)

Pre-1940 February and Post-1950 February, Pre-1940 October and Post-1950 October: Significantly homogeneous. (Spearman test, $P=0.05$)

differ significantly according to season of the year or ages of the doctors. Accordingly, the numbers of items derived from the different sources which were prescribed in February and October have been combined. The combined values for the group registered before 1940 have been compared with those for the group registered after 1950 in Table IV. The significance of the differences in the use of the sources has been compared, and those which are significant at a value of $P=0.01$ are indicated in the Table.

TABLE IV.—*Percentage Use of Therapeutic Sources According to Time of Medical Registration: Individual Item Comparisons*

Source of Therapeutic Knowledge	Combined Values			
	Pre-1940		Post-1950	
	No. of Items	%	No. of Items	%
Medical training	1,492	32·1	1,415	36·0
Consultant advice	298	6·4	492	12·5*
Textbooks	103	2·2	42	1·1*
Periodicals	213	4·6	172	4·4
B.N.F.	658	14·1	561	14·3
Prescribers' Journal	84	1·8	32	0·8*
M.I.M.S.	160	3·4	20	0·5*
Drug firms	1,519	32·6	819	20·8*
Discussion with colleagues	129	2·8	377	9·6*

Significant differences between the use of the individual therapeutic sources by the two age-groups are shown in the last column by an asterisk. The combined figures for the investigations in February and October have been used and differences are significant at $P=0.01$.

It is clear from Table III that the doctors tended in general to derive their knowledge for prescribing to the same extent from the available sources. Although the relative importance of the nine sources was the same for doctors of different age-groups, comparison of the use of the individual sources indicates that there were significant differences in the extent to which they were used. The older doctors obtained a greater proportion of therapeutic information by discussion with pharmaceutical representatives and by reading pharmaceutical mailings and *M.I.M.S.* (Table IV). The increased use of the *Prescribers' Journal* in October occurred because it was making a large impact

on the doctors who were admitted to the *Register* before 1940, and who were employing it as a source of therapeutic information for writing their prescriptions (Table III). The younger doctors did not use either the pharmaceutical industry or the *Prescribers' Journal* so much; they used consultant advice and discussion with colleagues to a greater extent.

Percentage Use of Therapeutic Source in Respect of Type of Practice

The extent to which the therapeutic sources were used at the different seasons of the year by doctors in single and multiple practices is shown in Table V. There were no significant differences in the distribution of use of the sources according to season of the year or type of practice. Since there is no significant difference in the relative order

TABLE V.—*Percentage Use of Therapeutic Sources in Single and Multiple Practices in February and October: Homogeneous Distribution Comparisons*

Source of Therapeutic Knowledge	Single Practices		Multiple Practices	
	Feb.	Oct.	Feb.	Oct.
Medical training	25·6	34·0	34·9	29·7
Consultant advice	14·4	14·0	7·9	9·3
Textbooks	0·8	0·7	2·3	1·0
Periodicals	5·8	2·4	5·9	4·9
B.N.F.	25·5	19·4	13·0	11·1
Prescribers' Journal	1·0	5·4	0·5	0·9
M.I.M.S.	7·6	1·8	2·9	2·3
Drug firms	15·1	17·9	28·2	34·6
Discussion with colleagues	4·2	4·3	4·4	6·3
No. of doctors	7		25	

Single practices, February and October: significantly homogeneous.
Multiple practices, February and October: significantly homogeneous.
Single practices, February *v.* multiple practices, February: significantly homogeneous.
Single practices, October *v.* multiple practices, October: significantly homogeneous.
All correlations are significant at P=0·01 except in the case of correlation for single and multiple practices (October), which is significant at P=0·05.

TABLE VI.—*Percentage Use of Therapeutic Sources in Single and Multiple Practices in February and October: Individual Item Comparisons*

Source of Therapeutic Knowledge	Combined Values			
	Single Practices		Multiple Practices	
	No.	%	No.	%
Medical training	767	30·07	3,030	32·50
Consultant advice	362	14·19	797	8·55*
Textbooks	19	0·74	158	1·69*
Periodicals	102	4·00	507	5·43
B.N.F.	567	22·23	1,127	12·15*
Prescribers' Journal	86	3·37	61	0·65*
M.I.M.S.	115	4·51	245	2·62*
Drug firms	423	16·58	2,902	31·13*
Discussion with colleagues	109	4·27	493	5·28
Total	2,550		9,320	
No. of doctors	7		25	

Significant differences between the use of the individual therapeutic sources in the two types of practice are shown in the last column by an asterisk. The combined figures for the investigations in February and October have been used and differences are significant at P=0·01.

of the sources used in February and October, the numbers of items for the two periods whose origin was ascribed to the different sources have been combined so that a better estimate can be obtained for the comparison between individual sources (Table VI).

All the correlations in Table V are significant at P=0.01 except for the correlation between single and multiple practices for October, which is significant at P=0.05. This difference is due to the increased use of the *Prescribers' Journal* in October as compared with its use in February. The ratio of older to younger doctors in single practice is the same as the ratio for older and younger doctors in multiple practice. This indicates that the increased use of the *Prescribers' Journal* in October by the doctors in single practice cannot be attributed only to the fact that the older doctors were reading it more than the younger ones; it indicates that the whole group of doctors in single practice were tending to make greater use of it as a source than their colleagues in partnership (Table VI). The doctors in single practice also tended to use the *B.N.F.* and *M.I.M.S.* to a significantly greater extent, but their use of the pharmaceutical industry as a source of therapeutic knowledge was significantly less. This smaller use of the pharmaceutical industry may be due to the fact that information from the representatives is discussed by all the doctors in the partnership; a representative's visit to one doctor may therefore affect the prescribing of all the doctors in the practice.

Discussion

The results of this investigation, carried out in October, 1962, fully confirm those of the first investigation, already described (Wilson *et al.*, 1963), which was made in February of the same year. The number of items prescribed in October was 90% of those prescribed by the same doctors in February. There was a significant alteration in only seven of the 23 diagnostic categories for which prescriptions were written. It was remarkable how constant the prescribing remained for most of these categories in the two different seasons. Prescribing was high and remained constant during both periods for neuroses, rheumatism, chronic bronchitis, and peptic ulcer. Backett *et al.* (1954) classed these as chronic or serious diseases and showed that they required the largest numbers of consultations for their treatment in an urban general practice. It is not surprising, therefore, that the present investigations show that the number of items prescribed for these diseases was high and constant during the year.

In spite of the significant differences in the incidence of some of the diseases during the year, the present results confirm that the doctors tended to use the sources of therapeutic knowledge to the same relative extent for their prescribing under different practice conditions and in different individual circumstances. The degree to which individual doctors used the sources varied greatly. For example, it was found that one doctor used medical training and the *B.N.F.* principally for his sources, whereas another predominantly used information derived from the pharmaceutical industry. In the tables, the figures for the use of the different sources are the means of the figures obtained from the forms of the 32 doctors who took part in both investigations. There is a wide range for the figures in each category in the two investigations, but the figures for each doctor's use of the therapeutic sources in February and October are almost identical in the diseases whose incidence did not change. The consistency in the use of the therapeutic sources by the whole group was due to the stability of an individual habit of prescribing on the part of each doctor; it was not due to random changes in the habits of the individual doctors in February and October. Such random changes could have given rise to an apparent but fallacious stability in the means for the whole group.

Their consistency in the use of therapeutic sources, together with the conformity of their diagnoses in two-thirds of the disease categories throughout the year, would predispose to the development of a pattern of prescribing in the whole group which would also tend to remain unchanged throughout the year. This pattern would depend upon the selection of individual sources of therapeutic information by the different doctors, and upon the incidence of disease in the different practices. It is characterized by the constant relationship between the diagnoses made by, and the use of the therapeutic sources by, the individual doctors

at the different weekly and seasonal periods during the year. Social and epidemiological factors may cause changes in individual doctors' diagnoses, and economic and advertising pressures may alter individual doctors' therapeutic habits. However, it is clear that such effects must be relatively large before the general pattern of prescribing of a group of doctors undergoes any significant change.

The therapeutic habit of the individual doctor is fairly constant over the relatively short period of a few years. However, the present investigation has shown that it can be altered by the official support which is given to periodical publications from the Ministry of Health in the case of the *Prescribers' Journal*. It is interesting to observe how the increased use of the *Prescribers' Journal* occurred particularly among the older group of doctors and among doctors in single practice. It is possible that the short articles and factual information in the *Prescribers' Journal* appealed to the older doctors because of the convenient nature of their presentation. The results in October confirm the February findings that the doctors in single practice use the *B.N.F.* more than their colleagues in partnership. It is therefore not surprising to find that the former also use the *Prescribers' Journal* significantly more than their colleagues, since it is issued as an official publication for distributing up-to-date information to general practitioners (*Prescribers' Journal*, 1961), and therefore it may presumably be regarded as a supplement to the *B.N.F.*

The alteration in prescribing habit produced by the publication of the *Prescribers' Journal* was relatively small and was not as large as the increase in use of the pharmaceutical industry as a therapeutic source during October. Small alterations may, however, become permanent over a period of time, as is illustrated by the progressive increase in the annual prescription of proprietary drugs as recorded in the annual Ministry of Health reports. It is probable that the figure of 2% for the use of the *Prescribers' Journal* as a therapeutic source will be maintained in the prescribing pattern, and it is possible that this proportion will continue to increase at the expense of the pharmaceutical industry and *M.I.M.S.* as therapeutic sources.

Alterations in the use of several of the sources also occur progressively over long periods. This is illustrated by the differences between young and older doctors. Although their patterns of prescribing were similar, the therapeutic habits of older doctors were significantly different in several respects from those of the younger doctors. Whether this alteration in therapeutic habits occurred as the result of progressive change as the doctors grew older, or because the respective medical education of the two groups inculcated different habits, cannot be determined with the available evidence. It is possible that medical education before the war did not equip doctors adequately to discriminate between the many kinds of treatment now available.

The general practitioner's role in the National Health Service is to treat the diseases which he diagnoses with the aid of his own knowledge of therapeutics, or with the aid of the hospital or public health services. The present investigations indicate that principals in general practice make extensive use of their early medical education in therapeutics even though it must clearly have been deficient in instruction about the use of many modern drugs. These deficiencies may have been due to inadequate training or to the rapidity of therapeutic advances since training ceased. The standard of treatment in general practice depends on the extent to which doctors use the information which is available to them, and how they select from this information. Their selection of therapeutic information forms the basis of the prescribing pattern which is indicated by the figures in the reports of the Ministry of Health. The results of this investigation indicate that when doctors become principals in general practice their therapeutic knowledge is augmented from those sources which are currently and most readily available to them in their surgeries.

Summary

Thirty-two general practitioners took part in an investigation in February, 1962, and the study was repeated in October, 1962, with the co-operation of the same doctors. They recorded their diagnoses of disease, and the sources of therapeutic information which they used for deciding on the medication which they prescribed. The results of the second study are reported in this paper and are compared with those of the first study.

In the two investigations there was a significant change in the numbers of items prescribed in only seven of the 23 diagnostic categories for which prescriptions were written. The relative use of the different therapeutic sources by the whole group of doctors in the two seasons was not significantly different. However, there were significant differences in the extent to which some individual sources were used, and these may have been related to the incidence of disease and the doctors' available time in the winter and early autumn. There was a significant increase in the use of the *Prescribers' Journal* in October, when twice as many issues had appeared, as in February. The increased use of the *Prescribers' Journal* occurred particularly among older doctors and in single practices.

Differences in the use of individual therapeutic sources were observed among doctors of different age-groups and in single and multiple practices. The significance of differences in respect of season of the year, age of the doctors, and type of practice has been discussed with reference to the availability of therapeutic information to the doctors.

Although such differences were observed, it was remarkable to note the general constancy both in the numbers of items recorded under each diagnosis and in the use of the therapeutic sources at the two seasons of the year over the group as a whole. This would predispose to the development of a pattern of prescribing. It is possible that small alterations in this pattern may continue for a period of time and they may ultimately become incorporated into the normal prescribing pattern. Such small alterations are exemplified by the increase in the influence of the *Prescribers' Journal* on prescribing, and by the increase in the prescription of proprietary drugs during the past years.

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