

An evaluation of direct access radiology in general practice

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SUMMARY. An analysis of the use of direct access to radiology by 71 general practitioners in Scotland is described and is based on 2,596 x-ray examinations in 2,409 patients during a period of six months. Almost half of the patients had to travel more than five miles for their examinations, but time lost in travelling was a much less important factor than the interval elapsing before the requested examination was completed. Nearly one third waited at least two weeks. Referral for diagnosis was by far the commonest reason and direct access was estimated to save 270 hospital outpatient appointments per month. I believe that general practitioners under-use rather than abuse radiology, which might be extended by a selective system of appointments.

Introduction

THE general practitioner has been defined as: "The person who provides the personal, primary, and continuing medical care to individuals and families . . . and he accepts responsibility for making an initial decision on every problem his patient may present to him, consulting with specialists when he thinks it appropriate to do so" (RCGP, 1972). General practitioners now make increasing use of investigations which were available previously only to hospital staff, although access to x-ray services and some laboratory investigations has always been more readily available than for example physiotherapy and electrocardiography. Despite requests that all these services should be available on direct access, the hospitals appear to be reluctant to grant this. Lack of staff may be the main problem and this has certainly been a factor in some areas in Scotland, where radiological services have recently been curtailed.

General practitioners recognize the essential contribution investigations make to efficient primary health care. Doctors now entering general practice after working in vocational training expect availability in order to provide adequate care. Hospitals will continue to be the portal through which most family doctors obtain necessary radiological investigations, as there is unlikely to be any early large increase in health centres with their own x-ray units.

Questions still remain about reasons for using the service, types of x-rays, incidence of abnormalities, and especially whether the information obtained really assists the general practitioner. Is there a reduction in referral to outpatient clinics? Is there any relationship between waiting time for examination and the length of time that patients are certified as being 'unfit for work'?

Aims

The aims of the survey were: first to describe the use of x-ray facilities by family doctors practising at various distances from them, and secondly, to record the decisions they made as a result of the information obtained.

Method

In order to obtain information about x-ray referral from as varied a population as possible, it was decided that the patients should come from urban and rural practices from as widespread an area as possible. There were 69 doctors from single-handed and partnership practices in Perthshire and the East of Scotland who agreed to take part and one doctor in Skye and one in Orkney. Of these doctors, 62 participated for the whole of the study, while nine doctors took part for varying shorter periods, having to withdraw for a variety of personal reasons unconnected with the study itself.

In order to stimulate enthusiasm and to make early personal contact with the general practitioners, preliminary meetings were held in three area centres. These meetings also provided opportunities to discuss

possible difficulties and thereby achieve consistency of recording among the different practices.

The pilot study suggested that 71 doctors would be expected to refer at least 2,000 patients for direct access radiology during a period of six months (October to March). A separate case sheet was completed for each patient referred for direct access radiology and, until it was sent to the recorder, it was kept in the patient's medical record envelope where it was readily available for entering further information as the occasion arose. This ensured that the general practitioner's decisions and comments could be recorded at the actual time they were made and not at a later date when they might no longer be accurate.

Details of each patient were entered in three sections: first, at the time the original request was made (much of this might already be available on the envelope); secondly, when the x-ray report was received by the practitioner; and finally, when the patient was given the information and the doctor decided on further treatment or management.

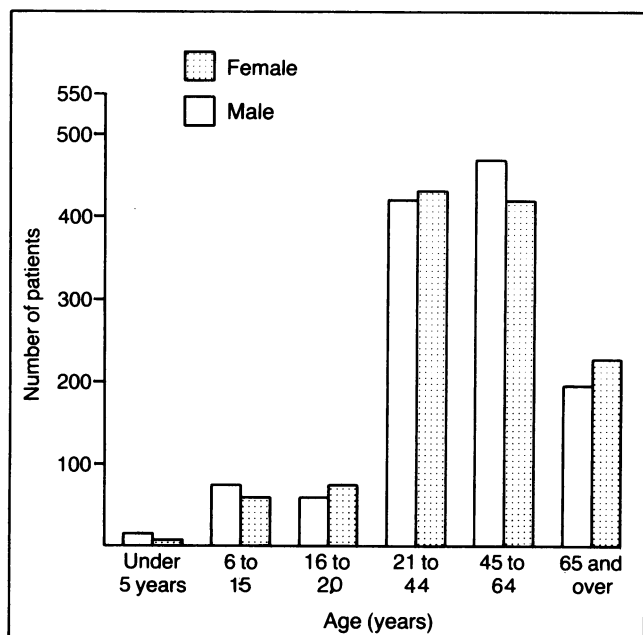
It was at this stage that the doctor commented whether the x-ray examination had assisted his decision making and whether, in his opinion, it would have been necessary to send the patient for consultant examination if direct access facilities had not been available. It was hoped that any bias in these comments would be reduced to a minimum if the study was carried out for as long a period as possible by as many doctors as possible.

Results

Patients

In the six months from October 1973 to March 1974, 2,596 examinations were carried out on 2,409 patients

Figure 1. Age/sex distribution of patients (N = 2,409).



(1,203 male, 1,206 female). The age/sex distribution of patients is shown in Figure 1.

A further 74 patients referred for x-ray examination failed to attend and were excluded from the study. Unfortunately the reasons for non-attendance are not known but they may have been due either to improvement in the patient's condition (the patient no longer seeing the need for examination) or to deterioration (the patient perhaps having been admitted to hospital or being unable to attend).

Distances and transport

Table 1 shows the distances between the doctors' surgeries and the x-ray units and the distances patients had to travel to the units from their homes. It should be noted the patients were not necessarily referred by the doctor at the corresponding mileage.

The average was about two referrals per doctor per week, but there was in fact a considerable variation. During the six months of the survey, one doctor made two referrals while two other doctors each referred more than 100 patients for examination.

The different means of travelling to the x-ray centres are shown in Table 2.

If travelling time is included, 2,380 patients spent half a day or less attending for x-ray examination and only 29 patients reported that a whole day was necessary.

Reasons for referral

In addition to diagnostic and medico-legal considerations there are other reasons for x-ray examinations. They include:

Table 1. Distances of patients and doctors from x-ray centres.

		Distance to x-ray centre		
		From patient's home		From doctor's surgery
Number of patients		Number of patients	Number of doctors for these patients	Average for these doctors
261	<1 mile	5	271	54.2
1,074	1 to 5 miles	25	913	36.5
782	5 to 10 miles	21	768	36.5
292	>10 miles	20	457	22.9
Total 2,409		71	2,409	

Table 2. Method of travelling to the x-ray unit by patients, (Percentages are given in brackets.)

Private car or taxi	1,169	(48.6)
Bus	775	(32.2)
On foot	343	(14.2)
Ambulance	82	(3.4)
Other	40	(1.6)

Table 3. Reasons for referral to an x-ray unit. (Percentages are given in brackets.)

To aid diagnosis	2,030	(84.3)
Patient reassurance	278	(11.5)
Patient request	57	(2.4)
Medico-legal	4	(0.2)
Other (e.g. pre-employment medical)	40	(1.6)
Total	2,409	(100)

Percentages have been rounded.

Table 4. Main disease groups of patients and reason for referral.

Disease groups	Reason				Total
	Diagnostic	Patient reassurance	Patient request	Medico-legal and other	
Respiratory	610	96	15	11	732
Musculo-skeletal	624	63	10	2	699
Gastro-intestinal	372	22	10	4	408
Non-acute trauma	102	26	4	4	136
Neoplasms	71	7	1	0	79
Circulatory	62	4	0	3	69
Other	189	60	17	20	286
Total	2,030	278	57	44	2,409

1. Patient request—the patient initiates the request, sometimes insisting that the examination should be done.

2. Patient reassurance—the doctor decides that an x-ray examination would reassure the patient although it is not essential on purely clinical grounds.

Reasons for referral in the study are given in Table 3.

Disease groups

The distribution of provisional diagnosis or main symptom for each patient, coded according to the RCGP Classification of Morbidity, is shown in Table 4, which also gives the reason why x-ray examination was requested.

The 'Diagnostic' group included those referred for examination at the time of the initial investigation and also those who were referred for follow-up and progress examinations.

From the 2,030 referrals for diagnostic reasons, 1,606 had symptoms relating to the respiratory, gastro-intestinal, or musculoskeletal systems. These three groups also account for the largest number of patients referred in the 'Patient request' and 'Patient reassurance' categories.

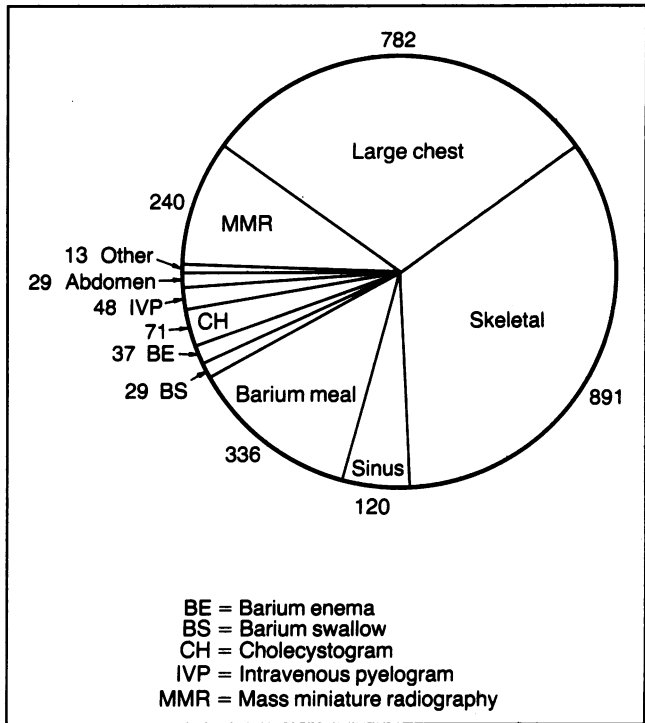


Figure 2. Number and types of x-ray examination.

Table 5. Incidence of positive radiological findings. (Percentages are given in brackets.)

	Chest	Skeletal	Contrast	Sinuses	Other	Total
Examinations performed	1,022	891	521	120	42	2,596
Positive x-ray findings	357 (34.9)	465 (52.2)	255 (48.9)	59 (49.2)	11 (26.2)	1,147 (44.2)

X-ray examinations

There were 2,204 patients (91.5 per cent) who attended hospital for their x-ray examination while 205 (8.5 per cent) visited mass miniature radiography units; 35 mass miniature chest examinations were carried out in hospital x-ray departments. Barium swallow, barium meal, and cholecystogram examinations were available to all general practitioners in this survey, and in a few areas barium enema and intravenous pyelogram examinations were also available.

Cases of acute trauma were not included, because many such patients are referred (or go themselves) to hospital casualty departments, which means that the general practitioner has less control over the patient's treatment and management.

Figure 2 shows the number and types of x-ray examination and in 93 per cent a single examination only was requested. A total of 172 patients had multiple

Table 6. Confirmation of diagnosis by diagnostic groups. (Percentages are given in brackets.)

	Respiratory	Musculo-skeletal	Gastro-intestinal	Non-acute trauma	Neoplasms	Circulatory	Other	Total
Number of patients	732	699	408	136	79	69	286	2,409
Number of diagnoses confirmed	458 (62.7)	401 (57.4)	202 (49.7)	85 (62.9)	15 (19.5)	41 (60.8)	171 (59.8)	1,373 (57)

Table 7. Disease groups of patients who required further consultant opinion.

Musculoskeletal and non-acute trauma	157
Respiratory	82
Gastro-intestinal	48
Neoplasms	22
Circulatory	11
Other	43

examinations and these were a combination of two, three, or four different types of x-ray. In these combined examinations large chest films were carried out for 116 patients and, for 84 patients, one or other form of contrast examination was included.

In 222 patients additional examination was sought, the suggestion coming either from the radiologist (205) or the general practitioner (17).

X-ray findings

Of 2,596 x-ray procedures no fewer than 1,147 (44 per cent) were reported as showing abnormal radiological findings, including 49 per cent of various contrast examinations, 52 per cent of skeletal, and 35 per cent of chest examinations (Table 5). The lower number of abnormal findings in chest examinations may well be due to the frequent need to be able to reassure a patient if he has had symptoms related to the cardiovascular or respiratory systems.

This appears to be borne out in Table 6 where the general practitioner's diagnosis made at the time of referral was confirmed in 63 per cent of respiratory disorders and 61 per cent of cardiovascular disorders. Only 19 per cent of diagnoses in the 'Neoplastic' group were confirmed, although 53 per cent of examinations carried out for patients in this group did show abnormal findings. There was confirmation of general practitioners' diagnoses in 57 per cent of patients and this of course included those where it was considered by the doctor that no radiological abnormality would be found.

Patient management

When a decision is made for x-ray referral, the family doctor must also decide whether to start treatment immediately or await the result of the investigations; in any case, treatment or management has to be reviewed

when the x-ray report is available. In this study the initial management was recorded as being continued in 1,655 patients (compare this 68.7 per cent with the total figure of 57 per cent of patients in whom the original diagnosis was confirmed). A change of treatment or an initiation of treatment was decided on in 319 patients (13.2 per cent) while earlier treatment was stopped in 64 (2.7 per cent).

After their original x-rays, 354 patients were referred to consultant outpatient clinics and a further nine were admitted to hospital. Of these consultant referrals 93 per cent had been x-rayed initially for diagnostic reasons. The disease groups of these patients are shown in Table 7.

The participating doctors estimated that 1,601 patients (66.5 per cent) would have required an appointment at hospital clinics if direct access had not been available. Information obtained from these services was felt to have helped treatment and management in 2,247 patients (93.3 per cent).

Waiting times

Within a week of initiating referral 1,112 examinations (43 per cent) were carried out (Table 8). Of the films taken within this time 1,002 were for skeletal, large chest, or mass miniature x-rays. Thirty per cent of all examinations were not done until at least two weeks after the general practitioner's request and of these 63 per cent were contrast examinations. Twenty per cent of patients referred for contrast x-rays had to wait more than six weeks although only five per cent of all referred patients had to wait for this length of time.

Over 95 per cent of x-ray reports reached general practitioners within seven days of examination. This information had been given to over 90 per cent of patients within a further 14 days.

Table 9 shows the waiting time for x-ray examinations for 822 female and 913 male patients of working age. Of the 579 patients who waited more than two weeks for their examination 100 were sent for large chest, 256 for contrast, and 187 for skeletal x-rays.

A total of 226 (27.5 per cent) female and 429 (47 per cent) male patients were certified as being unfit for work at various times during the study (Table 10). More than 50 per cent of them were absent for two weeks or more and most of these were diagnosed as having respiratory (107), gastro-intestinal (58), or musculoskeletal (88) disorders. Although duration of incapacity and waiting

Table 8. Waiting time for x-ray examination for all patients. (Percentages are given in brackets.)

Days delay until examination	Type of x-ray							Total
	Skeletal	Large chest	Contrast	MMR chest	Sinuses	Straight abdomen	Other	
1 to 7	392	397	42	213	49	15	4	1,112 (42.8)
8 to 14	235	249	148	18	34	9	6	699 (26.9)
15 to 28	231	110	137	4	24	5	2	513 (19.8)
29 and over	29	24	188	4	12	0	1	258 (9.9)
Total	887	780	515	239	119	29	13	2,582

Fourteen x-rays were carried out on the same day as requested.
MMR Mass miniature radiography.

time cannot be related, the extent of incapacity where the doctor requires an x-ray and the detection rate is high (Table 5) is a clear indication of the need for ready access to this service.

Discussion

A main aim in the study was to obtain factual information from general practitioners on their use of direct access radiology and to assess how much help this use gave them in the management of their patients. The opinions of general practitioners are especially relevant at a time when increasing emphasis is being laid on medical care in the community (Scottish Home and Health Department, 1977).

Comparisons of referral rates for radiological investigations have been made between doctors qualifying before and since 1945 (Forbes, 1966), between more experienced doctors and trainees (Wallace *et al.*, 1973), and among practices of different types in the Aberdeen area (Mair *et al.*, 1974).

Although individual practice age/sex analyses and consultation rates were not recorded, this study shows that 71 doctors with widely varying practices averaged just under six referrals per month. For most of the patients in the study, availability, accessibility, transport, and travelling time to x-ray centres were not a problem.

For over 75 per cent of patients, examination was considered necessary because of symptoms related to the respiratory, musculoskeletal, or gastro-intestinal systems.

Negative findings may be as important to the general practitioner as positive ones and for the patient a report of "no abnormality" has been shown often to be therapeutic (Davis and Williams, 1968). In this study, abnormal findings were reported in 44 per cent of all examinations and the general practitioner's diagnosis was supported in 57 per cent of patients referred. These figures broadly agree with studies by Davis and

Table 9. Waiting time from request to examination for males aged 16 to 65 and females aged 16 to 60.

Type of x-ray	Days						Total
	0	1 to 7	8 to 14	15 to 28	29 to 42	43 +	
Mass miniature radiography	0	182	13	3	1	2	201
Large chest	1	275	172	83	9	8	548
Contrast	5	27	99	110	54	92	387
Skeletal	2	266	166	169	13	5	621
Sinuses	1	32	21	16	1	5	76
Straight abdomen	0	12	6	5	0	0	23
Other	0	3	4	2	1	0	10
Total	9	797	481	388	79	112	1,866

Williams (1968), Mair *et al.* (1974), and Wallace *et al.* (1973). Cook (1966), reporting on the first year of an 'open door' x-ray department, stated that the service was used on the whole with discrimination and that the detection of abnormalities remained at as high a level as referrals of similar patients from hospital outpatient or casualty departments. Howie (1974) commented that the availability of x-ray facilities enabled a family doctor to fulfil his primary function as a diagnostician within the boundaries of his training and experience and concluded: "Used with proper discretion the patient can only gain from such an additional service".

The hospital service too should gain. Mair and colleagues (1974) noted that direct access referrals accounted for 12 per cent of all patients examined in the x-ray departments in the city of Aberdeen. Lodge (1973) stated that general practitioner referrals formed between five to 10 per cent of an x-ray department's work, but that this is more than offset by outpatient clinic requests if patients are referred instead to

Table 10. Disease groups with days of certified incapacity (patients of working age).

Disease groups	Males (aged 16 to 65)				Females (aged 16 to 60)			
	Days of incapacity							
	1 to 7	8 to 14	15+	Total	1 to 7	8 to 14	15+	Total
Respiratory	45	50	75	170	31	18	32	81
Gastro-intestinal	16	9	42	67	6	10	16	32
Musculoskeletal	28	19	52	99	12	15	36	63
Non-acute trauma	11	8	17	36	4	1	13	18
Neoplasms	2	7	9	18	0	0	5	5
Other	8	7	24	39	10	5	12	27
Total	110	100	219	429	63	49	114	226
Percentage per sex	25.6	23.3	51	100	27.9	21.7	50.4	100

hospital. In the opinion of the family doctors in this study, 66 per cent of patients would have required hospital referral had direct access radiology not been available—nearly 270 patients per month. The saving of consultant time, to say nothing of the patient's loss of earnings and personal inconvenience, seems considerable. Furthermore, the general practitioner's knowledge of his patient, his background, and previous medical history may enable initial investigations to be more selective and therefore reduce the time and expense for procedures not considered to be immediately necessary. If a reduction in the number of referrals through outpatient clinics could be achieved this would also mean shorter waiting times for other patients.

For 363 patients, the initial examination indicated the need for consultant referral, although only nine required immediate hospital admission. Otherwise outpatient appointments were arranged for an average of 60 referrals per month. Since x-rays are available to consultants in outpatients, they may then be able to make immediate, firmer management decisions. In the Aberdeen study, Mair and colleagues (1974) found that out of 178 direct access referrals for barium meal examinations, 16 had repeat examinations requested by the hospital doctor within three months of the original x-ray. In all but one of these cases there was a valid reason for the repeat request.

Davis and Williams (1968) stated that the aim of their health centre x-ray unit was to provide an efficient service for those who could be cared for by their own practitioner. An important factor towards achieving this was a short waiting interval and a rapid reporting time. Many patients remain anxious until their symptoms have been fully investigated and explained, and for them a radiological examination may well have a therapeutic value. The sooner it can be carried out the better, particularly for the working population who need to return to full employment as soon as possible. Only 43 per cent of patients were examined within one week of the request being made, while 30 per cent had to wait more than two weeks. The longer intervals related

particularly to contrast and musculoskeletal examinations. Davis and Williams (1968) showed that many patients with low back pain were referred to orthopaedic outpatient departments simply for an x-ray examination. Doctors using the Cardiff general practitioner x-ray unit also stated that barium meal, gall bladder, barium enema, and excretion urography examinations were valuable facilities. The need for future care of patients at home by the general practitioner was stressed, especially when direct access to radiology was combined with the ready availability of laboratory services.

Conclusions

This study shows that the family doctor considered that his management of individual patients had been helped by 93 per cent of x-ray referrals. Moreover, 66 per cent of all patients in the study could well have required to be seen at consultant clinics if the general practitioner had not had direct access to x-ray facilities. Eighty-four per cent of patients had been referred for diagnostic reasons; the general practitioner's diagnosis was confirmed in over 55 per cent of all referrals. A high level of positive findings was reported at these examinations. General practitioners do not generate the work falling on x-ray departments: the morbidity is there and has to be dealt with. Direct access is seen therefore as a valuable aid.

Health Service administrators and planners need to keep under review the range and types of radiological services offered to general practitioners. Long waiting times for some types of examination might be shortened and absence through sickness might be reduced by offering earlier appointments on a selective basis to employed people whose illness has been of recent onset. This would also reduce a period of anxiety for many people.

General practitioners need to continue to use these hospital-based investigations with care and discrimination. How they can do so might be an appropriate

subject for discussion in vocational training and continuing education.

Regular and direct contact between family doctors and consultant radiologists should also help to increase understanding of each other's problems.

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