Care of diabetic patients in hospital clinics and general practice clinics: a study in Dudley

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SUMMARY. A five year retrospective casenote review was undertaken of 452 patients attending 11 different general practice diabetic clinics, and 506 patients attending a diabetic clinic at hospital A and 210 patients attending a diabetic clinic at hospital B. The populations attending the clinics, the degree of glycaemic control achieved and the monitoring for the development of diabetic complications were investigated. Insulin dependent patients comprised 57.9% of patients attending the diabetic clinic at hospital A, 35.7% at hospital B and 25.0% of patients attending the diabetic clinics at general practices. Of these 55.6%, 37.3% and 30.1% respectively received multiple daily insulin injections. Hospital A had a higher proportion of patients under 40 years old than hospital B or the general practice clinics. The ages of diabetic patients attending the general practice diabetic clinics were broadly similar to those attending hospital B. Significantly more general practice patients, both insulin and non-insulin dependent, had a mean blood glucose level of less than 11 mmol l^{-1} compared with patients attending clinics at hospitals A and B ($P<0.001$). Glycosylated haemoglobin levels did not differ between patients attending hospital A and the general practice clinics. More non-insulin dependent and insulin dependent diabetic patients attending the general practice clinics and hospital A had been monitored satisfactorily for diabetic retinopathy (general practice clinic 68.8% and 39.7% respectively, hospital A 61.7% and 43.5%) than at hospital B (43.0% and 19.4%). Referral rates among all groups for ophthalmological assessment were similar. Regular blood pressure recordings were completed for 91.8% of patients attending the general practice clinics, compared with 93.9% of patients attending hospital A and 100% of patients at hospital B. A total of 63.2% of patients attending the diabetic clinics at general practices had their feet monitored satisfactorily for diabetic complications, compared with 56.3% of patients attending hospital A and 74.5.0% of patients attending hospital B. There was no evidence that the general practice diabetic clinics were less successful than the hospital diabetic clinics in the control and monitoring of diabetes.

Keywords: diabetes mellitus; GP clinics; hospital clinics; management of disease; comparative studies.

Introduction

FEES for health promotion clinics introduced in the new contract for general practitioners will increase general practitioners' interest in caring for diabetic patients. If it is appropriate for care to be undertaken in general practice, then it must be demonstrated that general practice as a whole, rather than just enthusiastic individuals, can provide care equivalent to that of a district general hospital, both in terms of achieving glycaemic control and in monitoring for diabetic complications.

This study, carried out in Dudley health district prior to the introduction of the new contract for general practitioners, looked at those patients who were attending either a diabetic clinic run by their general practice or one of the two hospital diabetic clinics in the district. The study assessed glycaemic control in the patients attending the general practice diabetic clinics and in those attending the hospital clinics, and looked at the clinics' monitoring of patients for complications of diabetes.

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Method

Provision of diabetes care

Medical care for diabetic patients in Dudley health district has historically been provided by two acute hospitals (hospitals A and B), situated five miles apart. Both hospitals have a diabetic clinic. Between 1979 and 1983 11 general practices in the Dudley area established their own diabetic clinics in association with hospital A, which actively seeks to discharge patients to these general practice diabetic clinics. All but one of the general practice clinics are geographically closer to hospital A than to hospital B, and historically would have referred patients there. Thus, hospital B has fewer patients whose general practitioners run diabetic clinics to which they could be discharged.

The 11 general practice diabetic clinics are autonomous, providing clinical care independently of either of the hospital clinics. They have a total list size of 106 550 patients, the partnership size ranging from two to six. Two were training practices at the time of the study. Two maintained a diagnostic register.

Patients remain the responsibility of their general practitioner unless specifically referred to a consultant at the hospital. The general practice clinics use the same specific diabetic record system as at hospital A, and are supported by quarterly educational meetings which are organized by a general practitioner. The clinics, both hospital and general practice, have the support of a biochemistry technician who provides a blood glucose estimation for patients attending the clinic, a dietitian, and a diabetes nurse specialist. The hospital clinics have direct access to chiropody. Two of the general practice diabetic clinics are held on alternate months, the others are monthly. The hospital clinics are staffed by a consultant, clinical assistant and one medical registrar; hospital B also has a senior house officer. Both hospitals have a main morning clinic, and a smaller afternoon clinic. Of the general practice clinics, nine are held during the late morning, and two in the afternoon.

Patient sample

This study was based on a five year review of diabetic patients' clinic notes undertaken in 1989 and 1990. Notes were reviewed of all patients attending the 11 general practice clinics and the clinic at hospital A and a one in four random sample of those attending hospital B. Patients were excluded if they had made less than four clinic visits or if they had been attending for less than one year. In the general practice clinics, only those patients who had a set of diabetic notes were included. Review of casenotes was undertaken by S P. Age, mode of treatment, duration of diabetes and duration of follow up were recorded on computer. No attempt was made to standardize the populations studied for social class.

Some patients whose general practices ran a diabetic clinic would nevertheless have been attending a hospital clinic. The characteristics of this population of patients were examined separately.

Glycaemic control

Glycaemic control was assessed as the mean of the last three clinic blood glucose readings. In addition, the phlebotomist attending the general practice clinics and hospital A requested measurement of glycosylated haemoglobin levels on every fifth blood glucose sample taken. These patients were not matched for age or duration of diabetes.

Monitoring for diabetic complications

Monitoring for complications was considered 'satisfactory' if the following criteria were fulfilled: annual blood pressure monitoring for those who had protein detected in the urine, or every five years if not; foot examination every three years for those aged 40 years and older; two-yearly fundal examination for non-insulin dependent patients with no signs of retinopathy, annual fundal examination for all insulin dependent patients and for non-insulin dependent patients with retinopathy (patients seeing an ophthalmologist regularly or who were blind were excluded from fundal examinations). Referral for ophthalmology during the study period and whether photocoagulation was performed were investigated. The criteria were agreed after a pilot study and after discussion with diabetologists from outside the district and with a specialist in diabetic eye disease. The frequency of monitoring for proteinuria was not investigated since all clinics performed this at each patient attendance.

Only a proportion of patients would have been attending the clinics for five years, and this proportion would differ between the clinics. The longer the period of follow up the more difficult it was in this study to achieve categorization of monitoring as satisfactory. Therefore, to ensure comparability between clinics when assessing monitoring, separate subsets were constructed of insulin and non-insulin dependent patients from hospital A and the general practice clinics to match those from hospital B with respect to duration of follow up.

Analysis of results

Statistical analysis used chi square testing with Yates' correction for continuity;[1] P values of less than 0.05 are reported as significant. Hospital B was used as the index district general hospital diabetic clinic. Therefore, all significant figures, unless stated otherwise, compare hospital A or the general practice clinics with hospital B.

Results

Patient sample

Of the 2328 patients attending the diabetic clinics the notes were scrutinized of 1572 patients — all of those at hospital A (616) and the general practice clinics (704) and a one in four sample of those at hospital B (252). A total of 404 were excluded from the study (252 from general practices). The proportion of patients who were excluded because they had attended less than four times in all, rather than because they had been followed up by the clinic for less than a year, was 127 (50.4%) at the general practice clinics and 53 (34.9%) at the hospital clinics ($P<0.01$). A total of 1168 patients (74.3%) were included in the study, 506 at hospital A, 452 at the general practice clinics and 210 at hospital B.

Insulin dependent and non-insulin dependent patients

Table 1 shows the treatments for diabetes received by the patients at the clinics. Hospital A had the largest proportion of insulin dependent patients (57.9% compared with 35.7% at hospital B and 25.0% at the general practice clinics). Of the 293 insulin dependent patients at hospital A, 55.6% received multiple daily insulin injections, significantly more than at hospital B (37.3%) or the general practice clinics (30.1%) ($P<0.01$). Of the 213 non-insulin dependent patients treated at hospital A, 166 (77.9%) were on oral antidiabetic drugs, significantly more than at hospital B (86/135, 63.7%, $P<0.01$). There was no significant difference between the proportion of non-insulin dependent patients taking an oral antidiabetic drug at the general practice clinic (241/339, 71.1%) and those at either of the hospital clinics.

Table 1. Treatment received by the patients attending the diabetic clinics at hospitals A and B and the general practice clinics.

	% of patients:		
Treatment	Hospital A ($n=506$)	Hospital B ($n=210$)	General practices ($n=452$)
Multiple daily insulin injections	*32.2*	*13.3*	*7.5*
Single daily insulin injections	*25.7*	*22.4*	*17.5*
Oral antidiabetic drugs	*32.8*	*41.0*	*53.3*
Diabetic diet only	*9.3*	*23.3*	*21.7*

n = number of patients at clinic.

Age

The ages of patients attending the three clinics are shown in Table 2. Both insulin dependent and non-insulin dependent patients were more likely to be under 40 years old at hospital A than at hospital B or the general practice clinics ($P<0.001$ and $P<0.05$, respectively). At hospital A, 128 were insulin dependent patients under 40 years old while non-insulin dependent patients aged 60 years and over comprised the largest groups at both hospital B and the general practice clinics (89 and 270 patients, respectively).

Patients attending general practice clinics and hospital clinics

Of the patients attending hospital A, 111 (21.9%) were registered with general practices which held a diabetic clinic. Of these patients 19.8% were non-insulin dependent, and 49.5% received multiple daily insulin injections. Of those treated with insulin 56.2% were aged under 40 years. These were significantly different from the percentages for the 395 hospital A patients registered with general practices which did not run diabetic clinics (48.4%, $P<0.001$; 27.3%, $P<0.001$ and 38.7%, $P<0.01$, respectively.) In hospital B, only 23 patients (11.0%) were registered at practices with a diabetic clinic. There were similar trends for the mode of treatment, but the differences between the two groups were not significant. The age distribution of patients with access to a general practice clinic was the same as for those without access.

Length of time since diagnosis

Analysis of the length of time since patients' diagnosis of diabetes showed that there was no significant difference between hospital B and the general practice clinics (Table 2). However, non-insulin dependent patients at hospital A had been diagnosed significantly more recently than those at hospital B ($P<0.001$) and more recently than those at the general practice clinics ($P<0.001$).

Table 2. Age, length of time since diagnosis, and blood glucose levels of the insulin dependent and non-insulin dependent patients attending the hospital clinics and general practice clinics.

	% of patients at:					
	Hospital A		Hospital B		General practice clinics	
	Insulin dependent ($n=293$)	Non-insulin dependent ($n=213$)	Insulin dependent ($n=75$)	Non-insulin dependent ($n=135$)	Insulin dependent ($n=113$)	Non-insulin dependent ($n=339$)
Age (years)						
<40	*43.7*	*5.6*	*14.7*	*2.2*	*21.2*	*0.3*
40–59	*33.1*	*39.9*	*24.0*	*31.9*	*22.1*	*20.1*
60+	*23.2*	*54.5*	*61.3*	*65.9*	*56.6*	*79.6*
Length of time since diagnosis (years)						
<5	*22.5*	*59.2*	*13.3*	*35.6*	*9.7*	*36.3*
5–9	*23.9*	*23.0*	*22.7*	*43.7*	*19.5*	*37.8*
10+	*53.6*	*17.8*	*64.0*	*20.7*	*70.8*	*26.0*
Blood glucose level (mmol l^{-1})						
<11	*32.4*	*60.1*	*36.0*	*51.9*	*57.5*	*74.6*
11–16	*43.3*	*38.0*	*41.3*	*38.5*	*35.4*	*23.0*
17+	*24.2*	*1.9*	*22.7*	*9.6*	*7.1*	*2.4*

n = number of patients at clinic.

Length of attendance

At hospital B, 70.7% of insulin dependent patients had been attending for five years or more, compared with 53.2% at hospital A ($P<0.05$) and 49.6% at the general practice clinics ($P<0.01$). The percentage for non-insulin dependent patients were 57.8% for patients who had been attending for more than five years at hospital B, compared with 29.1% at hospital A ($P<0.001$) and 29.2% at the general practice clinics ($P<0.001$).

Glycaemic control

The mean of patients' last three clinic blood glucose levels were estimated (Table 2). The hospital clinics had similar proportions of patients with a mean blood glucose level of less than 11 mmol l^{-1}, but this proportion was significantly greater at the general practice clinics ($P<0.001$).

The data were then analysed by age group (Table 3). No significant differences were found between the two hospital clinics. However, in all three age groups, more patients achieved a mean blood glucose level of less than 11 mmol l^{-1} at the general practice clinics than at the hospital clinics; this reached significance ($P<0.001$) in non-insulin dependent patients over 60 years. Data were also analysed according to length of time since diagnosis (Table 3). Again, the general practice clinics had more patients with a mean glucose level of less than 11 mmol l^{-1} in each of the groups. This reached significance for non-insulin dependent patients diagnosed within the last five years ($P<0.001$), and for both non-insulin and insulin dependent patients diagnosed over 10 years ago ($P<0.05$, and $P<0.01$, respectively). Again, no differences between the hospital clinics were revealed.

For glycosylated haemoglobin measurements, a total of 150 and 100 samples were analysed from the general practice clinics and hospital A respectively. Seven patients from the general practice clinic and four patients from hospital A were selected for glycosylated haemoglobin level estimation twice by the randomizing process; the second of these estimations was eliminated from the study. Glycosylated haemoglobin level recordings were, for non-insulin dependent patients, hospital A (55 patients) 10.8%, standard deviation (SD) 2.2% and general practices (100 patients) 10.5%, SD 2.4%. For insulin dependent patients, the results were hospital A (41 patients) 11.7%, SD 2.5% and general practices (43 patients) 11.9%, SD 2.7%.

Monitoring for complications of diabetes

The clinics' monitoring of long term complications of diabetes was examined (Table 4). Hospital B, where nurses measured blood pressure at each clinic visit, achieved blood pressure

Table 3. Insulin dependent (ID) and non-insulin dependent (NID) patients attending diabetic clinics at hospitals A and B and the general practice clinics who had a blood glucose level of less than 11 mmol l^{-1}, by age and length of time since diagnosis.

	% of patients in each group with blood glucose level <11 mmol l^{-1} (total no. of patients in group)					
	Hospital A		Hospital B		General practice	
	ID	NID	ID	NID	ID	NID
Age (years)						
<40	*43.8* (128)	*50.0* (12)	*36.4* (11)	*0* (3)	*70.8* (24)	*100* (1)
40–59	*21.6* (97)	*71.8* (85)	*33.3* (18)	*58.1* (43)	*60.0* (25)	*76.5* (68)
60+	*26.5* (68)	*52.6* (116)	*37.0* (46)	*50.6* (89)	*51.6* (64)	*74.1* (270)
Length of time since diagnosis (years)						
<5	*39.4* (66)	*64.3* (126)	*70.9* (10)	*47.9* (48)	*72.7* (11)	*87.8* (123)
5–9	*35.7* (70)	*55.1* (49)	*29.4* (17)	*61.0* (59)	*50.0* (22)	*70.3* (128)
10+	*28.0* (157)	*52.6* (38)	*31.3* (48)	*39.3* (28)	*57.5* (80)	*62.5* (88)

Table 4. Monitoring for complications of diabetes, by clinic.

Monitoring	% of diabetic patients attending clinic at: Hospital A	Hospital B	General practices
Blood pressure			
Annual check if proteinuria (n = 15/10/26)	*26.7****	*100*	*76.9*
Five yearly check if no proteinuria (n = 329/197/242)	*97.0**	*100*	*93.4****
Feet			
Three yearly check if 40+ years (n = 247/196/253)	*56.3****	*74.5*	*63.2**
Fundi			
Two yearly check for non-insulin dependent patients with no retinopathy (n = 107/121/173)	*61.7***	*43.0*	*68.8****
Annual check for insulin dependent patients and those with retinopathy (n = 177/62/68)	*43.5**	*19.4*	*39.7**
Ophthalmological referral (n = 284/183/241)	*11.6*	*13.1*	*17.0*
Photocoagulation therapy as a result of ophthalmological referral (n = 33/24/41)	*78.8*	*45.8*	*41.5*

n = number of patients eligible for test at hospital A/hospital B/general practice clinics. *P<0.05; **P<0.01; ***P<0.001.

tients had their feet examined at the general practices than at hospital A, but less than at hospital B. A smaller percentage of patients had their fundi examined at hospital B than at hospital A or the general practice clinics. General practitioners referred the largest proportion of patients for ophthalmological assessment. Hospital A referred the smallest proportion but had the highest rate of photocoagulation.

Comparison of general practice clinics

Examination of the variation between the general practice clinics was undertaken (Table 5). The use of aggregated data from the general practice clinics obscured poor care in some practices and a high standard of care in others. The data given are the extremes for that parameter, rather than from individual good or bad practices. The standardized subsets used elsewhere in this paper to compare satisfactory monitoring were not used here since numbers were too small in some clinics.

Table 5. Level of care provided by the 11 general practice diabetic clinics.

	Mean % (range)
Diabetic patients who are insulin dependent	*24 (13 to 60)*
Patients with blood glucose level <11 mmol l^{-1}	
Insulin dependent	*38 (20 to 78)*
Non-insulin dependent	*75 (53 to 84)*
Patients with satisfactory monitoring of diabetic complications	
Feet[a]	*65 (22 to 100)*
Blood pressure[b]	*91 (72 to 100)*
Fundi[c]	*65 (19 to 88)*

[a]Three yearly check if 40+ years. [b]Annual check if proteinuria, five yearly check if no proteinuria. [c]Two yearly check for non-insulin dependent diabetic patients with no retinopathy, annual check for insulin dependent patients and those with retinopathy.

Discussion

Part of the purpose of this study was to describe population differences between the clinics. The differences themselves, of course, raise difficulties when comparing clinic performance. When comparing standards of monitoring, this was corrected for by constructing appropriate subsets. For glycaemic control, data are presented for separate groups by age and duration of diabetes.

It must be emphasized that, by the criteria adopted for inclusion into the study, only those patients who actually attended the clinics were considered, a factor particularly relevant to the general practice clinics. No attempt was made to undertake a population based survey, nor even a survey of all diabetic patients registered with the general practices involved. The high rate of exclusion from the study of patients from general practice clinics may be a reflection of the recent introduction of these clinics. More of the patients were likely to be established on treatment and well controlled and therefore to be attending the diabetic clinic infrequently.

The analysis shows that among the patients treated at hospital A, a greater number of younger insulin dependent patients and more patients on multiple dose regimens were seen whereas the general practice clinics saw a greater number of non-insulin dependent patients aged 60 years and over. The highest percentage of patients attending hospital B were also non-insulin dependent diabetic patients aged 60 years and over.

The treatment and age profiles of patients attending the general practice clinics were broadly similar to those of patients at hospital B. The evidence from this study that the local general practice diabetic clinics enabled patients with less complicated problems to be discharged from hospital A to general practice care differs from results elsewhere. In a study of patterns of work three years after the establishment of a diabetes mini-clinic system in Norwich, hospital workload remained unchanged.[2]

The opportunity to discharge such patients to general practice care may leave hospital A with a larger proportion of patients having either concurrent non-diabetic disease or diabetic complications. It might also be argued, however, that the high proportion of elderly patients (aged 60 years and over) seen at hospital B may also impose a heavy burden of care of non-diabetic pathology.

The criteria for satisfactory monitoring used in the study were designed to discriminate between clinics. They were adopted before the British Diabetic Association recommendation that screening procedures should be on an annual basis.[3] The study confirms the conclusion of Singh and colleagues that 'general practitioners providing diabetic care on an organized basis can achieve a degree of glycaemic control in diabetic patients equal to that reached by a hospital clinic'.[4] No evidence was found that general practitioners were less conscientious overall than hospital clinics at monitoring for complications. It may be seen as reassuring that the general practitioners referred a higher percentage of patients for ophthalmology assessment. In fact, they may have been overcautious, given the smaller proportion of referred patients receiving photocoagulation.

All results for monitoring the feet and eyes for diabetic complications were disappointing and it could be argued that the general practice clinics only performed as well as the hospital clinics because the hospital clinics performed badly. Unpublished data from a London diabetic clinic showed similar disappointing results, that only 55% of patient attending in 1986 had undergone fundoscopy in the previous year and that 38% of patients had had no foot examination within the previous two years (R Jones and C Williams, personal communication).

It is estimated that approximately 50% of diabetic patients attend hospital clinics.[5-7] General practitioners have sole respon-

sibility for those not attending hospital clinics, but the care of diabetic patients seen at routine general practice appointments has not been good, whether assessed in absolute terms or by comparison with hospital clinics.[2,6-10] Individual practices have demonstrated high standards of care,[9,11,12] but it would not be reasonable to advocate a wide ranging system of general practice care on the basis of excellent results from a small number of enthusiasts. It seems likely that structured care on the Wolverhampton mini-clinic model would improve general practice performance,[13] but until recently there have been no reports of a comparison between standards of diabetic monitoring in a substantial number of mini-clinics and adjacent hospital clinics. A study of monitoring during the introduction of a mini-clinic system in Norwich has been published, the emphasis of which was on encouraging overall improvement in care, rather than on comparison between general practice and hospital.[2] This present study has demonstrated, for the first time, that the quality of monitoring for diabetic complications in a large group of organized general practice clinics is as good as that in hospital clinics.

The variations found between the 11 general practices are of concern. The pooled data obscure poor monitoring standards in some practices. However, the study results have been reported to all clinics and clear comparisons have been drawn between overall figures and those for individual clinics. The importance of efficient monitoring systems has been emphasized and it is now suggested that annual examination of eyes, feet and blood pressure is appropriate. It is intended to continue monitoring the situation to establish whether this exercise has resulted in better care.

The new contract encourages general practitioners to establish diabetic clinics. The results of this study emphasize the need for audit and reiterate the point made by others,[2] that this is a major undertaking which demands considerable resources.

This study demonstrates that standards of diabetes care in structured general practice clinics with full ancillary staff support, both in terms of glycaemic control and monitoring for complications, can be as high as those in conventional hospital clinics. However, improvements are necessary in both settings.

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