How effective is systematic care of diabetic patients? A study in one general practice

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SUMMARY. A method of systematic diabetic care compatible with personal lists, the 'diabetic day', was introduced into a seven partner inner city general practice. The effect on glycosylated haemoglobin levels and the recording of six process measures (fundoscopy, visual acuity, weight, blood glucose levels, glycosylated haemoglobin levels and blood pressure) was assessed. Of the 111 known registered diabetic patients, 64 entered the diabetic day and fulfilled the eligibility criteria. General practice records were analysed retrospectively over a period of four years — the two years before entry into the diabetic day were compared with the subsequent two years. Mean glycosylated haemoglobin levels fell from 10.52% in the year before entry to the diabetic day to 9.71% in the second year after entry (P<0.01, 95% confidence intervals 0.19 to 1.39). There was a significant increase in all process measures recorded in the general practice notes after entry into the diabetic day.

The introduction of systematic care for diabetic patients led to an improvement in recorded process measures and a reduction in patients' glycosylated haemoglobin levels in a general practice which had made previous efforts to improve diabetic care and was already well staffed, organized and motivated.

Keywords: diabetes mellitus; management of disease; GP clinics.

Introduction

DIABETES is a major cause of mortality and morbidity, much of which is preventable.[1-3] It is likely that as the proportion of elderly people in the population rises diabetes will become increasingly prevalent. Screening could increase the known prevalence by 40%.[4] General practice is being asked to take on a larger share of this increasing workload[5,6] and most diabetic patients would prefer to have general practitioners involved in their future care.[7]

Studies comparing the standard of care received by diabetic patients in hospital clinics and in regular general practice surgeries have shown apparently inferior care in the latter; higher mortality rates, higher glycosylated haemoglobin levels, higher rates of hospital admissions, irregular review and low recording of process measures having been found in patients receiving diabetes care in general practice.[8,9] However, a study comparing organized systematic care in committed general practices with hospital care showed no significant difference between the two.[6] Could this be attributed to the systematic organization of diabetic care or to the level of commitment?

To help answer this question the effect of introducing systematic care into a general practice which had long been committed to regular and comprehensive diabetic review was evaluated. Diabetic patients' glycosylated haemoglobin level and the recording of process measures in their general practice notes were compared for the two years before and two years after entry into the diabetic system (the 'diabetic day'[10]). The aim of the monthly diabetic day is to reduce patients' glycosylated haemoglobin level and to improve the quality of surveillance through increased use of process measures. A similar system showed an increase in surveillance in the year after its introduction, but it is not known if this was sustained.[11] No general practice study has shown a decrease in glycosylated haemoglobin levels as a result of introducing systematic care for diabetic patients.

Method

The practice has seven partners, two trainees and two practice nurses. It is based in a large purpose built health centre in central London. Approximately 80% of the 13 500 patients are designated a deprivation allowance. The diabetic day takes place on one day each month and the practice as a whole and especially the practice nurse, focuses on seeing patients with diabetes. The nurse spends 40 minutes with each patient for an annual check and 20 minutes otherwise. The nurse takes a history of smoking, exercise, diet and alcohol, and also gives health education, counsels, assesses the patient's urine testing technique, carries out all process measures except fundoscopy and estimation of glycosylated haemoglobin level and records all findings on a flow sheet in the notes. Each general practitioner runs normal 10 minute appointment surgeries during the day but includes two or three appointments for diabetic patients; those coming for an annual check have a double appointment. A dietitian and a chiropodist see the patients regularly. A clerk updates and maintains the recall register, compiles the appointment list and sends out invitations.

The study sample consisted of those diabetic patients who were diagnosed and registered with the practice at least two years before entry into the diabetic day, remained registered for two years after entry into the diabetic day, and attended the diabetic day on at least one occasion.

Data covering a four year period were extracted retrospectively from patients' general practice records by M K. Prior to the diabetic day there was already a specific place in the records to record all process measures except visual acuity and fundoscopy. To avoid under-reporting, all sections of the records, including continuation sheets were scrutinized. Data on patients from the two years before entry to the diabetic day were compared with the two subsequent years.

All measurements of glycosylated haemoglobin levels were carried out in the same laboratory using the Corning® (Geigy Corning Diagnostics) electrophoretic method (normal range 5-8%). The laboratory was subject to the national quality assessment scheme for glycated haemoglobin and this detected no downward drift during the study period (Piper K, quality assessment coordinator, University College and Middlesex School of Medicine, London, personal communication). Process measures were expressed as the percentage of patients who had received standards of care as set by the Royal College of General Practitioners[12] in that they had at least one measurement recorded per year for each of the following: weight, glycosylated haemoglobin level, blood glucose level, fundoscopy, visual acuity and blood pressure. Process measures carried out in hospital were not included.

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Analysis

The statistical package for the social sciences *(SPSS)* was used to analyse the data. McNemar's test for matched proportions was used for each process measure; two way analysis of variance and the paired *t* test for glycosylated haemoglobin levels, analysis of variance for comparisons of age, years since registration and years since diagnosis; and the chi square test for sex proportions and treatment types.

Results

There were 111 patients on the diabetic register when the diabetic day scheme began in 1985. Of these, 26 patients were excluded from the study for the following reasons: 12 patients were housebound and consequently could not attend the health centre, six had died, three left the practice before a data set was completed, three were diagnosed as having diabetes less than two years before they entered the diabetic day and the notes of two patients were missing. Nineteen patients remained under hospital specialist care by mutual agreement between patient and general practitioner and two patients refused to attend either the diabetic day or a hospital specialist. The 64 study patients entered the diabetic day system of care over a period of 20 months; 91% of these patients had seen a general practitioner in the year before they entered the diabetic day system. The prevalence rate of diabetes of 0.82% at the start of the diabetic day had increased to 0.94% two years later.

Patients under hospital specialist care only and the two patients refusing any care were significantly more likely to be younger, to have been diagnosed longer and to be using insulin than those attending the diabetic day (Table 1). The patients excluded from the study had similar characteristics to those entering the diabetic day except that they were more likely to be older.

For each process measure the recording of data in the general practice notes from one and two years before entry into the diabetic day were compared with the recording of data one year and two years after entry (Table 2). Differences were found at the $P<0.001$ level of significance for the recording of all six processes except for blood glucose levels where differences were significant at the $P<0.01$ level for the year before entry into the diabetic day compared with two years after. Comparisons of two years before entry with one year before entry showed no statistically significant differences except for glycosylated haemoglobin levels and blood glucose levels where there was an increase in recording a year before entry into the diabetic day ($P<0.05$). Sixteen of those who did not have fundoscopy or visual acuity performed in the second year after entry into the diabetic day had either retinal photography performed or were referred to an ophthalmologist. If these patients are added, the percentages in the second year after entry increase to 76.6% for recording of fundoscopy and 85.9% for recording of visual acuity. Patients attended the diabetic day on a mean of 2.0 occasions per year.

Glycosylated haemoglobin level results were not available for all patients one year and two years after entry into the diabetic day because glycosylated haemoglobin level is an indicator of blood glucose levels in the previous two months. Consequently results from patients' first attendance at the diabetic day were designated as results for the year preceding entry into the diabetic day, patients therefore had to have a second recording of glycosylated haemoglobin level in the first year after entry to the diabetic day in order to have a result for that year. Other reasons for incomplete results included, for example, six patients who did not attend in the second year. The mean percentage of glycosylated haemoglobin for the eight patients who had a record of the measurement in their notes two years before entry into the diabetic day was 10.89%; this had fallen to 10.57% for the 64 patients with a record in their notes one year before the diabetic day. The percentage continued to fall one year after entry into the diabetic day (10.01% for 53 patients) and two years after

Table 1. Characteristics of the 64 patients attending the diabetic day, the two patients refusing care and the 19 patients attending the hospital specialist and the 26 patients excluded from the study.

	Patients attending the:		
	Diabetic day ($n=64$)	Specialist, plus those refusing care ($n=21$)	Patients excluded from study ($n=26$)
No. of males	36	10	12
Mean age (range) (years)	62 (31–92)	52 (18–80)*	71* (43–88)
Mean no. of years since registration (range)	16 (4–46)	13 (4–31)	14 (3–39)
Mean no. of years since diagnosis (range)	11 (4–35)	16 (6–44)*	11 (2–38)
% of patients receiving:			
Oral antidiabetic drugs	*63*	*19*	*62*
Diabetic diet only	*11*	*14**	*12*
Insulin therapy	*27*	*67*	*27*

n = number of patients in group. *$P<0.05$.

Table 2. Percentage of patients attending the diabetic day for whom process measures were recorded in the general practice notes one and two years before entry into the diabetic day, and one and two years after entry.

	% of patients attending diabetic day ($n=64$)			
Process measure recorded in notes	Two years before entry	One year before entry	One year after entry	Two years after entry
Weight	*35.9*	*46.9*	*100*	*90.6*
Glycosylated haemoglobin level	*12.5*	*26.6*	*100*	*84.4*
Blood glucose level	*46.9*	*70.3*	*100*	*93.8*
Fundoscopy	*4.7*	*3.1*	*89.1*	*51.6*[a]
Visual acuity	*6.3*	*1.6*	*98.4*	*60.9*[b]
Blood pressure	*46.9*	*57.8*	*100*	*92.2*

n = number of patients. [a] 76.6% if include patients referred to ophthalmologist or for retinal photography. [b] 85.9% if include patients referred to ophthalmologist or for retinal photography.

entry (9.71% for 54 patients). Two way analysis of variance between the last three years showed a significant fall at the $P<0.05$ level of significance. Comparison of the 54 patients who had had their percentage of glycoslyated haemoglobin recorded in their general practice notes both one year before and two years after entry into the diabetic day showed a fall in the percentage of glycosylated haemoglobin from 10.52% to 9.71% (paired t test, $P<0.01$). A comparison of the frequency distribution of glycosylated haemoglobin levels before and after entry to the diabetic day showed a change in most patients and a shift away from glycosylated haemoglobin levels over 10% (Figure 1).

Discussion

While the prevalence of diabetes rose slightly over the study period, a prevalence of 0.94% was still low. However, in terms of age, sex, years since diagnosis and type of treatment, the figures in this study were consistent with those reported elsewhere.[11,13,14]

Two years after entering the diabetic day system of care, patients' mean glycosylated haemoglobin level had decreased significantly, indicating an improvement in diabetic control. The mean glycosylated haemoglobin level of 9.71% two years after entry into the diabetic day is comparable with results from regular attenders in Wolverhampton where a similar laboratory method was used to measure percentage of glycosylated haemoglobin.[6] It is probable that the natural progression of diabetes tends towards an increase in glycosylated haemoglobin level with time.[15] It is also probable that a decrease in glycosylated haemoglobin level must be maintained over many years to be of benefit; longer follow up is therefore needed. The use of a control group could have strengthened the results but was not possible in this study.

The number of ophthalmological investigations was particularly low before entry into the diabetic day, suggesting that the general practitioners found these especially difficult. Given that prevention of blindness is now possible with early detection,[1] the large increase in the number of ophthalmological investigations carried out is important. There was a fall off in the second year after entry into the diabetic day system of care, but some of this was a result of increased use of retinal photography and referrals to ophthalmologists. These findings suggest that general practitioners should consider instituting a recall scheme for regular ophthalmological examinations. If general practitioners do not feel competent in examining fundi themselves and have no retinal photography service, they could refer their patients to an optometrist, a diabetologist or an ophthalmologist.

The 64 study patients entered the diabetic day system of care over a period of 20 months. The data therefore reflect work carried out in the diabetic day up to 44 months after it began. This makes it unlikely that the improvements resulting from the diabetic day could be entirely attributed to the Hawthorne effect, that is, an improvement which occurs shortly after a change but which does not persist as it results from change itself.[16] The effect may explain the small fall off in recorded process measures in the second year. Longer follow up would therefore be useful. It is worth noting that only 9% of the diabetic patients had not been seen by their general practitioner in the year before entry to the diabetic day, that the practice offered relatively long appointments, had a low list size, had two ancillary staff per doctor, was computerized and had made previous attempts to improve diabetic care.

There was a significant increase in process measures recorded in patients' notes after entry to the diabetic day. These results are similar to those found elsewhere.[11] The increase in recorded process measures was mainly due to the work of the practice nurse. The nurse also played the major role in health education which has been shown to be an important factor in reduction of glycosylated haemoglobin level.[17] The nurse and the recall system are the two most essential aspects of the diabetic day system of care. This kind of systematic care is ideally suited to the clinic format and it is hoped that the new health promotion

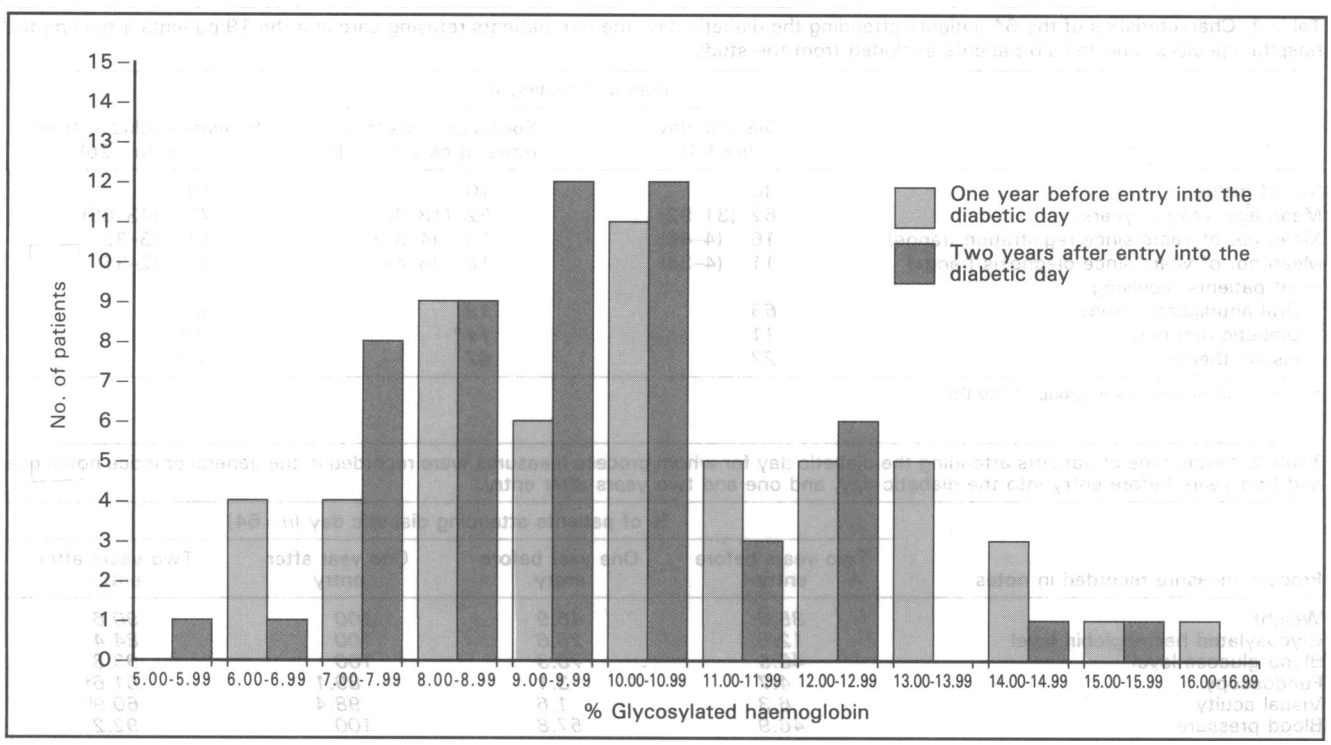

Figure 1. *Frequency distribution of the glycosylated haemoglobin levels for the 54 diabetic patients who had values recorded both one year before and two years after entry into the diabetic day.*

clinic payments will encourage general practitioners to set up these clinics. However, quality care can be expensive and it has been shown that the annual cost to the practice of running diabetic days is considerably greater than the health promotion clinic payments received from the family health services authority, and is greater than estimates of the cost of attendance at the outpatient department of a local trust hospital.[18]

This study has shown that the introduction of systematic care into a practice which is already well staffed, organized and motivated can lead to a significant improvement in care for diabetic patients.

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