Quality of Diabetes Care in the Community: A Cross-Sectional Study in Central Israel

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Abstract

Background: Good care of the diabetic patient reduces the incidence of long-term complications. Treatment should be interdisciplinary; in the last decade a debate has raged over how to optimize treatment and how to use the various services efficiently.

Objectives: To evaluate the quality of care of diabetic patients in primary care and diabetes clinics in the community in central Israel.

Methods: We conducted a retrospective cross-sectional study of a random sample of 209 diabetic patients in a district of the largest health management organization in Israel. Patients were divided into two groups – those treated only by their family physician and those who had attended diabetes clinics. Data included social demographics, medications, risk factors, quality of follow-up, laboratory tests, quality of diabetes and blood pressure control, and complications of diabetes.

Results: Of the 209 patients 38% were followed by a diabetes clinic and 62% by a family physician. Patients attending the specialist clinic tended to be younger ($P = 0.01$) and more educated ($P = 0.017$). The duration of their diabetes was longer ($P < 0.01$) and they had more diabetic microvascular complications ($P = 0.001$). The percentage of patients treated with insulin was higher among the diabetes clinic patients (75% vs. 14%, $P = 0.0001$). More patients with nephropathy received angiotensin-converting enzyme inhibitors in the diabetes clinic (94% vs. 68%, $P = 0.02$). Follow-up in the specialist clinic as compared to by the family physician was better in the areas of foot examination ($P < 0.01$), fundus examination ($P = 0.0001$), and hemoglobin A_1c testing ($P = 0.01$). On a regression model only fundus examination, foot examination and documentation of smoking status were significantly better in the diabetes clinic ($P < 0.05$).

Conclusion: There is still a large gap between clinical guidelines and clinical practice. Joint treatment of diabetic patients between the family physician and the diabetes specialist may be a proposed model to improve follow-up and diabetes control. This model of treatment should be checked in a prospective study.

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Type 2 diabetes is a common chronic illness that can lead to many complications and incurs huge expenditures for health services [1–3]. Good care of the diabetic patient reduces the incidence of complications [4–6]. The treatment of the diabetic patient should be interdisciplinary and should include physicians, nurses, dietitians and psychologists [1].

In the last decade a debate has raged over how to optimize treatment and how to use the various services efficiently [7–12]. Cross-sectional studies have demonstrated that various measurements of care quality are higher for patients treated in diabetes clinics than for those treated by the family physician alone [7,8,13,14]. Van Loon et al. [15], however, found little difference in the quality of care and treatment of diabetic patients between those treated by the family physician and those treated in specialist clinics [15]. Dinneen and collaborators [9] found that the control of diabetes by family physicians was stricter than that in the diabetes clinic. Haisch and Remmele [11] observed that an education program given by the family doctor improved control after 6 months. A review of the Cochrane Library [10] revealed that family physicians who use a computerized follow-up system perform better follow-up than do diabetes specialists.

The use of "shared care" [16–18] has become increasingly more popular, where responsibilities are divided between the diabetes clinic staff and the primary care clinic staff (physicians and nurses) in an attempt to raise standards of care while reducing costs. Shared care was pioneered by the diabetes clinic of the Royal Prince Alfred Hospital in Sidney, Australia in the mid-1980s [7]. This model forces the family physician to refer to the specialist clinic any diabetes patients who are poorly controlled or those who have suffered from one of the complications of diabetes. The specialist clinic did not conduct regular checkups of the diabetic patients and within 3 months of the consultation the patients had to return to the care of the family doctor. A repeat consultation at the diabetes clinic would be recommended only after 12–14 months, unless the family practitioner requested otherwise.

In the Clalit Health Services, the largest health management organization in Israel, a patient is listed on the register of a single family physician. The first visit to diabetes specialists (or any other specialist) is with a referral letter from the family physician. Follow-up is by invitation of the specialist without need for a new referral, and is not limited by any regulation regarding duration or frequency. In the last decade Clalit Health Services has invested resources to improve the treatment of the diabetic patient in primary care clinics, and to facilitate the family physician as the case manager. Guidelines for management of diabetic patients by primary care physicians and nurses were compiled, computerized follow-up charts were introduced, and family physicians and nurses participated in workshops on diabetes management. Despite these efforts, many patients are

still treated in specialist diabetes clinics. In the present study we aimed to evaluate the quality of care of diabetic patients in primary care and in diabetes clinics in the community in central Israel.

Patients and Methods

Study population

This retrospective cross-sectional study was undertaken in the central district of Clalit Health Services in Israel (more than 500,000 patients). Listed on the chronic disease register of the district are more than 22,000 diabetes patients. We included in the study patients between the ages of 40 and 75 who were registered in urban community practices and had a diagnosis of type 2 diabetes according to the chronic disease register. Patients undergoing dialysis were excluded. Using a computer-generated list of random numbers, a sample of 209 diabetics was taken. The diagnosis was confirmed in the patients' medical records. The patients were divided into two groups – those treated exclusively by the family physician and those who had been treated in addition in a diabetes clinic.

Data collection

Data were gathered from patients' medical records and from the central computer of the HMO. Missing information was gathered by direct phone calls to the patients. The following were checked:

- *Demographic data*: age, gender, occupation, marital status, education
- *Chronic diseases and cardiovascular risk factors*: smoking, hypertension, hyperlipidemia, obesity
- *Quality indicators of follow-up*: blood pressure measurements, foot and fundus examination, laboratory tests (HbA_1c, urine microalbumin, lipid profile in the last year), weight and height at least once, body mass index
- *Quality indicators of diabetes control*:
  - HbA_1c <7% = good control, HbA_1c >9% = poor control
  - Low density lipoprotein <100 mg/dl = good control
  - High density lipoprotein >40 mg/dl = good control
  - Blood pressure <135/85 mmHg = good control, <140/90 mmHg = reasonable control
  - Presence of microalbuminuria.
- *Diabetes complications*: nephropathy, microalbuminuria, retinopathy, neuropathy, macrovascular complications
- *Drug treatment*: Insulin and oral medications for diabetes; for lowering blood pressure, statins, aspirin.

Statistical analysis

Data were entered into an electronic spreadsheet and analyzed using SPSS for Windows software. Proportions were compared using the chi-squared test. Student *t*-test was used to compare means of continuous variables. Significance was set at the 5% level. A multiple regression model was used to assess associations between the dependent and independent variables. In this

HMO = health management organization

model the independent variables were patient education, length of time from the diagnosis of diabetes, and insulin treatment. The dependent variables were follow-up quality indicators.

Results

Of the 209 study patients 79 (38%) were followed by a diabetes clinic and the family physician and 130 (62%) by the family physician alone. Table 1 details the demographic background and clinical status of all the patients. Patients in the first group (specialist clinic and family physician) tended to be younger ($P = 0.01$) and had more years of education ($P < 0.01$). Their duration of diabetes was longer ($P < 0.01$) and they had more diabetes microvascular complications (more nephropathy $P = 0.001$, retinopathy $P < 0.001$, and neuropathy $P < 0.001$).

Table 1. Demographic and clinical data of patients

	All patients (n=209)	Diabetes clinic (n=79)	Family physician (n=130)	P
Age (yrs ± SD)	66.5 ± 10.3	64.2 ± 10.3	67.8 ± 10.1	0.01
Gender (% males)	50%	50%	50%	NS
Marital status				
Married	75%	77%	74%	
Widowed	18%	19%	18%	NS
Divorced	5%	1%	7%	
Single	2%	3%	1%	
Education (% with >12 yrs)	16%	24%	12%	0.017
DM duration (years ± SD)	9.2 ± 6.9	10.8 ± 8.2	8.5 ± 3.9	<0.01
DM complications				
Nephropathy	23%	38%	15%	0.001
Retinopathy	14%	28%	6%	<0.001
Neuropathy	12%	24%	5%	<0.001
Ischemic heart disease	25%	23%	27%	NS
Cerebrovascular accident	11%	11%	11%	NS
Peripheral vascular disease	15%	15%	15%	NS
Hypercholerolemia	49%	57%	45%	NS
Hypertension	59%	58%	59%	NS
BMI				
<25	12%	15%	10%	
25<BMI<27	13%	13%	12%	NS
27<BMI<30	25%	23%	27%	
>30	50%	49%	51%	

DM = diabetes mellitus, NS = not significant.

Table 2. Medications

	All patients (n=209)	Diabetes clinic (n=79)	Family physician (n=130)	P
Aspirin	45%	48%	43%	NS
Statins	45%	44%	45%	NS
Antihypertensives				
ACEI	65%	71%	62%	NS
Others	47%	47%	47%	NS
Hypoglycemics				
Oral	83%	80%	85%	NS
Insulin	23%	47%	9%	<0.001
Combined (oral and insulin)	14%	28%	5%	<0.001
No hypoglycemics	8%	1%	12%	0.01

Table 3. Quality of follow-up and diabetes control in the last year

	All patients (n=209)	Diabetes clinic (n=79)	Family physician (n=130)	P value
Quality of follow-up				
Measurement of BMI (at least once)	39%	39%	39%	NS
Blood pressure measurement	66%	71%	63%	NS
Feet examination	46%	67%	33%	<0.01
Fundus examination	60%	77%	49%	<0.001
Laboratory tests				
HbA$_1$c	75%	85%	69%	0.01
Microalbumin	57%	62%	55%	NS
Lipid profile	80%	86%	77%	NS
Smoking status documented	23%	43%	12%	<0.001
Quality of control				
Blood pressure				
<135/<85	24%	26%	24%	NS
<140/<90	39%	44%	36%	NS
HbA$_1$c				
<7 g/dl	23%	19%	25%	NS
>9 g/dl	17%	27%	11%	0.001
Microalbuminuria	26%	23%	28%	NS
Cholesterol				
LDL<100 mg/dl	25%	39%	16%	<0.001
HDL>40 mg/dl	72%	74%	71%	NS

Table 4. Regression model including disease severity (duration and insulin treatment), education and attending diabetes clinic, and the effect on quality of follow-up

	Insulin treatment	Education (in yrs)	Duration of DM	Attending a diabetes clinic
Smoking status	NS	NS	NS	0.28* ($P < 0.05$)
BMI	NS	NS	NS	NS
Blood pressure	NS	NS	NS	NS
HbA$_1$c	NS	NS	NS	NS
Microalbumin	NS	NS	NS	NS
Lipid profile	NS	NS	NS	NS
Foot examination	NS	NS	NS	0.28 ($P < 0.05$)
Fundus examination	NS	NS	NS	0.21 ($P < 0.05$)

* Beta coefficient

Table 2 lists the drug treatment in both groups. The percentage of patients treated with insulin or with insulin in combination with oral hypoglycemics was higher in the clinic plus doctor group ($P = 0.0001$ and $P < 0.0001$ respectively). We found that more patients with nephropathy received ACEI in this group (94% vs. 68%, $P = 0.02$). Similarly, a higher percentage of patients received aspirin as primary prevention, although the difference was not statistically significant (45% vs. 31%, $P = 0.09$).

The quality of follow-up and diabetes control is shown in Table 3. In the specialist clinic plus family physician group as compared to the family physician-alone group, foot examination, fundus examination and HbA$_1$c testing were done significantly more often ($P < 0.01$, $P = 0.0001$, and $P = 0.01$ respectively).

The percentage of patients receiving insulin and the length

ACEI = angiotensin-converting enzyme inhibitors

of time since diagnosis varied between the study groups. A regression model was used to check if there was a difference in diabetes control between the two groups independent of these factors. Only fundus examination, foot examination and documentation of smoking status were significantly better in the specialist clinic group in comparison to the family physician group [Table 4].

Discussion

Type 2 diabetes is common; in 1998 it affected 5.5% of the population over age 20 insured by Clalit Health Services [3]. Diabetic patients are cared for either by the family physician or in a specialist diabetes clinic.

Diabetes clinic patients tended to have more advanced disease, as evidenced by the length of time from diagnosis and the higher proportion of insulin-treated patients. It would appear that family physicians tend to refer diabetic patients who are already at an advanced stage of illness. Another possibility is that the diabetes clinic is more aware of the importance of earlier insulin prescription.

Nephropathy, retinopathy and neuropathy were all more commonly reported among the specialist clinic patients. In contrast, peripheral vascular disease and ischemic heart disease were equally prevalent in both groups. This could be due to underdiagnosis and under-reporting of microvascular complications by family physicians, a tendency to refer patients to the diabetes clinic after diagnosis of microvascular complications, or a direct correlation with the length of time since diagnosis of diabetes. Long-lasting disease in conjunction with poor control of diabetes may explain the higher prevalence of microvascular complications in patients attending the specialist clinic.

We found that university-educated diabetes patients were almost twice as likely to be cared for by a diabetes specialist, an observation also made by Zgibor and co-workers [13]. It is possible that higher levels of education bring a greater awareness of available services, leading to self-referrals or demands for referrals via the physician. It is also possible that family doctors believe that diabetes patients with higher levels of education will benefit more from the advice received in a specialist clinic.

Comparing our results with other reports [19,20] revealed that the prevalence of macrovascular complications and nephropathy is similar, while the prevalence of microvascular complications was lower. This would seem to suggest underreporting of microvascular complications, particularly by family physicians.

Hypercholesterolemia and hypertension were reported equally for both groups and the prevalence is similar to that in other studies [20]. Body mass index was recorded in only 40% of the patients. Indeed, it is worrisome that BMI was documented in such a low proportion of patients. In many patients only weight was recorded, information that by itself is of little clinical significance. In a national study by Goldfracht and Porat [21], BMI was recorded in a similar percentage of diabetes patients.

BMI = body mass index

Quality of follow-up

Clear differences between the family physician and diabetes clinic groups were found in the percentage of patients who had foot and fundus examinations. These results are similar to those in previous studies [22]. Foot examination, like most of the follow-up, can be performed by a nurse. The availability of a nurse trained specifically in diabetes care is clearly advantageous compared to a practice nurse who under pressure of time has to perform many other tasks apart from diabetes follow-up. These differences are apparent despite a recent national HMO project to improve the diabetes follow-up by nurses in primary care.

In only 75% of the patients was HbA_1c recorded at least once in the previous year. It should be noted that in a national report by Goldfracht and Liberman [22], only 22% of patients had undergone an HbA_1c in 1995. A steady improvement has been noted, with HbA_1c tested in 53% of diabetes patients in 2000 and 75% in 2002 (the current data). A similar trend of improvement was observed in the USA [23].

Smoking status was under-recorded. This means that family physicians as well as diabetes clinic specialists do not assess and treat all treatable cardiovascular risk factors.

Quality of treatment and control

The overall control of hypercholesterolemia was low. A higher percentage of patients in the diabetes clinic had good control of LDL levels (39% vs. 16%, $P < 0.001$). Hypercholesterolemia is a major treatable cardiovascular risk factor in diabetes patients and steps should be taken to improve its control.

The percentage of hypertensive patients was similar in both groups; about one-third of patients had not had their blood pressure measured at all in the previous year, which was lower than the 74% reported by Goldfracht and Liberman [22]. Blood pressure control was poor and similar in both groups (only a quarter of patients having good control), and similar to that reported in Israel and other countries.

Of patients diagnosed with nephropathy, 68% received ACEI from the family physician and 94% in the diabetes clinic group. These percentages seem high, but we did not find any study in the literature to make comparisons.

No difference was found in the percentage of patients with good control of HbA_1c in the two groups or in comparison with other community-based studies [24]. Of those patients with $HbA_1c > 9$ g/dl, a higher proportion of patients were treated in diabetes clinics – most probably due to the different case mix.

No significant differences were found between the two groups in the use of aspirin, statins, or blood pressure-lowering medications. However, implementing primary prevention alone, a higher proportion of specialist clinic patients were given aspirin. This difference was not statistically significant (45% vs. 30%), but the power of our study was not calculated for this subgroup. It should be noted that the rate in both groups

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LDL = low density lipoprotein

compare favorably to previous reports, namely, 13% of diabetes patients treated with aspirin for primary prevention [20]. With regard to secondary prevention, aspirin was used in a similar proportion of patients to that reported in other studies [25].

Possible confounding factors

It should be noted that patients in the specialist clinic group continued to be seen by their primary physician and therefore were being treated by two doctors. Some of the improvement in follow-up in this group could certainly be explained by the simple fact that two doctors can be more thorough than one.

Conclusions

There is still a large gap between clinical guidelines and clinical practice. Under-treatment and partial follow-up is more marked in patients treated by the family physician alone. The growth of family medicine as a specialty with wide-ranging skills and knowledge, with its improved communication, knowledge of the patient's surroundings, potential support systems and medical history should help increase patient compliance and enhance the medical follow-up of diabetic patients. Working under a very tight schedule – namely, allowing less than 10 minutes for the average family physician-patient appointment – may be one of the obstacles to implementing the guidelines.

Joint treatment of patients between the family physician and the diabetes specialist, where the patient pays alternative visits to the diabetes clinic and the family physician and both are responsible for the patient's long-term follow-up and treatment, may be a proposed model to improve diabetes control. This model of treatment should be checked in a prospective study.

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