Patient characteristics correlated with quality indicator outcomes in diabetes care

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ABSTRACT

Background

Quality indicators were adopted to compare quality of care across health systems.

Aim

To evaluate whether patient characteristics influence primary care physicians' diabetes quality indicators.

Design of study

Retrospective cohort study.

Setting

Primary care setting.

Method

The study was conducted in the Central District of Clalit Health Service in Israel. The five measures of diabetes follow-up were: the percentage of patients with diabetes for whom glycosylated haemoglobin (HbA_{1c}), microalbumin, low-density lipoprotein (LDL)-cholesterol, and blood pressure were measured at least once, and the percentage of patients who were seen by an ophthalmologist, during 2005. Three outcome measures were chosen: the percentage of patients with diabetes and HbA_{1c} <7 mg%, the percentage of patients with diabetes and blood pressure <130/80 mmHg, and the percentage of patients with diabetes and LDL-cholesterol <100 mg/dl in 2005. Sociodemographic information was retrieved about all the physicians' patients with diabetes.

Results

One-hundred and seventy primary care physicians took care of 18 316 patients with diabetes. The average number of patients with diabetes per physician was 107 (range 10–203). A lower quality indicator score for HbA_{1c} <7 mg% was correlated with a higher percentage of patients of low socioeconomic status (P<0.001) and new immigrants (P = 0.002), and correlated with borderline significance with higher mean patients' body mass index (P = 0.024); lower quality indicator score for blood pressure <130/80 mmHg was related to higher patients' age (P = 0.006). None of the diabetes follow-up measures were related to patients' characteristics.

Conclusion

Achieving good glycaemic control is dependent on patient characteristics. New immigrants, patients of low socioeconomic status, and older patients need special attention to avoid disparities.

Keywords

diabetes mellitus; family physician; family practice; immigrant; quality indicator; socioeconomic factor.

INTRODUCTION

Organisations such as the Organisation for Economic Cooperation and Development (OECD)[1] and National Diabetes Quality Improvement Alliance (NDQIA)[2] have recently adopted quality indicator (QI) programmes to compare quality of care across health systems. In Israel, a national QI programme in primary care was introduced in 2001,[3] integrating data from all the health maintenance organisations (HMOs) in Israel. Although the long-term outcomes of this programme are still unclear, in the short term, improvements in QI scores have been achieved.[3] Quality assessment has highlighted disparities in medical care attributed to factors such as insurance programme,[4] ethnicity,[5,6] and socioeconomic status.[7]

Patients' sociodemographic characteristics explain a substantial proportion of racial disparities in diabetes outcomes,[8] while use of a uniform treatment algorithm was found to abolish racial disparities in glycaemic control within 2 years.[9] A study on the UK GP Quality and Outcomes Framework data found practices located in deprived areas performed less well on quality measures than those based in affluent areas.[10]

Israel has a national health insurance with universal access to medical care. Health care is delivered by

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How this fits in

Physicians' quality indicator scores for outcome measures in patients with diabetes are related to the sociodemographic characteristics of their patients. A higher proportion of older patients, new immigrants, and patients of low socioeconomic status within the physician clinic were related to a lower percentage of patients achieving good glycaemic control. Quality indicators related to diabetes follow-up were not related to patients' characteristics. New immigrants, older patients, and those of low socioeconomic status need special attention to avoid disparities in quality of care.

four HMOs through the country. Every Israeli resident receives medical coverage from the HMO of their choice. Clalit Health Services is the largest HMO in Israel. It serves more than 50% of the population and more than 70% of the older patients (≥65 years). Patient records in Clalit Health Service have been completely computerised for over a decade, and an extensive healthcare database has been created. Patient records include demographic data, working diagnoses, medications, lab results, hospitalisations, referrals, and administrative data including patients' costs to the HMO. The demographic data are updated directly from the population registry of the Interior Ministry. All laboratory tests are sent to a central lab, and the results are sent directly to the primary care physician and to the patient's file. The working diagnosis of 'diabetes mellitus' detects over 90% of the known patients with diabetes.[11]

Clalit Health Service clinics are spread throughout the country; most of the primary care clinics serve their local neighbourhoods, which usually represent a relatively homogenous population. Clalit Health Service uses a passive capitation system, and all patients in Clalit Health Service have to choose a primary care physician who is responsible for their care. There is no co-payment for visiting the primary care physician or for having laboratory tests. There is a small co-payment for specialist visits (equivalent to $US 5).

The primary care physicians are responsible for diabetes follow-up for all patients on their list, including those seen in specialist diabetes clinics. QIs in diabetes care were introduced in Clalit Health Service as part of the national QI programme. All the physicians in Clalit Health Service are updated routinely about their QI scores, and get lists of patients who need improvement in their care. This has created a unique opportunity to evaluate factors influencing QI outcomes in the primary care setting.

Aim

The aim of this study was to evaluate whether patient characteristics influence primary care physicians' diabetes QI scores.

METHOD

The study was conducted in the Central District of Clalit Health Service in Israel, and received local ethics committee approval.

All QIs related to diabetes mellitus in the national QI programme were examined. Five performance measures related to diabetes follow-up: the percentage of patients with diabetes for whom glycosylated haemoglobin (HbA_{1c}), microalbumin, low-density lipoprotein (LDL)-cholesterol, and blood pressure were measured at least once during 2005, and the percentage of patients with diabetes who were seen by an ophthalmologist for retinal examination during 2005. Three outcome measures related to diabetes control: the percentage of patients with diabetes and HbA_{1c} <7 mg%, the percentage of patients with diabetes and blood pressure <130/80 mmHg, and the percentage of patients with diabetes and LDL-cholesterol levels <100 mg/dl according to their last result in 2005.

To avoid inconsistent results due to a change in the treating physician, data were gathered for patients of all the primary care physicians who started working in Central District of Clalit Health Service before 2004 and who were working in the same clinic until the end of the study period. Physicians were included if they treated at least 10 patients with diabetes.

All patients with diabetes who were treated by the same physician for over 2 years were included, and sociodemographic data including: age, sex, year of immigration to Israel (a patient was defined as a new immigrant if he or she had immigrated to Israel after 1990), and socioeconomic level (low socioeconomic status as defined by the National Insurance Institute of Israel according to patients' income) were recorded. Clinical information was retrieved, including HbA_{1c}, LDL-cholesterol, microalbumin, body mass index (BMI), blood pressure, diabetes clinic attendance, insulin use, and oral medication for diabetes use.

For each physician list, information was retrieved about the total number of patients and total number of patients with diabetes. To evaluate patient characteristics, a profile of patients with diabetes was created for every physician in the study. The following values were calculated for the physician's patients with diabetes: the percentage of females, percentage of new immigrants, and percentage of patients of low socioeconomic level from the total number of patients with diabetes; the mean age, mean BMI, and mean systolic blood pressure of the patients with diabetes; and the percentage of patients attending specialist diabetes clinics, percentage taking oral medications, and percentage treated with insulin from the total

number of patients with diabetes. Since patients with diabetes represent a significant proportion of the workload for the primary care physician, the percentage of these patients out of the total number of patients treated by each physician was calculated.

Linear regression was used to identify correlated variables. A stepwise method was used to identify correlated variables. The primary model included all available variables including demographics, treatment modalities, endocrinologist consultations, and workload of patients with diabetes. The final regression model included mean age and mean BMI as continuous variables, and sex (female versus male as baseline), low socioeconomic status (low versus non-low socioeconomic status), and immigrant status (new immigrants versus non-new immigrants) as dichotomous variables. Robust regression models with the same variables were used for QIs that were not normally distributed (microalbumin and blood pressure measure and blood pressure <130/80 mmHg). QIs of each physician were considered as dependent variables. A *P*-value of 0.01 was considered as significant. STATA (version 8.0) was used for statistical analysis.

RESULTS

One hundred and seventy primary care physicians were responsible for 301 625 patients (range 253–3296 per physician); 18 316 (6.1%) were patients with diabetes. The mean number of patients with diabetes per physician was 107 (range 10–203). Table 1 describes the cohort as a whole and the variability among the different physicians' practices.

Patients of low socioeconomic status with diabetes were older (63.9 versus 67.2 years; *P*<0.001) with slightly higher BMI (30.8 versus 29.7 kg/m^2; *P*<0.001), were more likely to be referred to an endocrinologist (14.1% versus 12.9% *P* = 0.012), and were more likely to be treated with insulin (21.3% versus 15.3% *P*<0.001).

New-immigrant patients with diabetes were younger (58.4 versus 68.7 years; *P*<0.001), were less likely to receive oral medications (74.7% versus 81.0%; *P*<0.001), were more likely to receive insulin (20.3% versus 16.0%; *P*<0.001), and more likely to be referred to an endocrinologist (15.7% versus 12.0%; *P*<0.001).

Patients who were referred to an endocrinologist were younger compared to those who were not referred (60.0 versus 65.9 years; *P*<0.001). Patients who were treated with insulin were younger than those not receiving insulin (60.3 versus 66.2 years; *P*<0.001). Table 2 presents the quality indicators of the cohort and the different practices.

Multivariate analysis

Outcome measures. In a multivariate regression model including age, sex, low socioeconomic

Table 1. Basic patient characteristics.

	Whole cohort	Range among the different physicians' practices
Number with diabetes	18 316	10–203
Mean patients' age, years	65.5	50.6–72.6
Males, %	49.7	4–100
New immigrants, %	11.4	0–72
Low socioeconomic status, %	37.9	0–73
Mean BMI, kg/m^2	30.8	24.7–36.9
Mean systolic BP, mmHg	137.6	120–154.5
Ischaemic heart disease, %	32.6	8–67
Seen by endocrinologist, %	12.9	0–50
Insulin treatment, %	17.1	6–50
Oral medications, %	79.3	58–100
Diet only, %	13.6	1.7–38.9

The numbers present the calculated average information for each physician's mean of patients with diabetes. BMI = body mass index. BP = blood pressure.

Table 2. Quality indicators.

	The whole cohort (18 341 patients)	Range among the different practices	Mean (%) ± SD among the different practices
Patients with HbA_{1c} measure in 2005[a], %	86.7	68–100	85.2 ± 9.1
Patients with LDL-cholesterol measure in 2005[a], %	73.4	43–100	87.2 ± 6.5
Patients with microalbumin measure in 2005[a], %	72.6	28–92	72.0 ± 13.0
Patients who visited an ophthalmologist in 2005[a], %	59.2	38–88	59.2 ± 8.9
Patients with BP measure in 2005[a], %	79.3	0–98	75.5 ± 23.2
Patients with HbA_{1c} <7 mg% (from those with HbA1c measure), %	41.1	21–86	44.6 ± 9.0
Patients with LDL-cholesterol <100 mg/dl (from those with LDL-cholesterol measure), %	50	24–83	50.0 ± 10.9
Patients with BP <130/80 mmHg in 2005 (from those with BP measure), %	28.1	0–100	44.7 ± 14.9

[a]*At least one measure during 2005. BP = blood pressure. HbA_{1c} = glycosylated haemoglobin. LDL = low-density lipoprotein*

Table 3. *P*-values for the quality indicators in the regression models.

	Sex[a]	Age	Low socioeconomic status	New immigrant	BMI
Outcome measures					
HbA_{1c} <7 mg%	0.323	0.054	<0.001	0.002	0.024
LDL <100 mg/dl	0.103	0.218	0.033	0.615	0.269
BP <130/80 mmHg	0.339	0.006	0.537	0.395	0.190
Performance measures					
HbA_{1c} measure	0.710	0.081	0.572	0.372	0.201
LDL measure	0.494	0.337	0.410	0.727	0.406
BP measure	0.386	0.292	0.208	0.419	0.108
Microalbumin measure	0.531	0.919	0.446	0.197	0.349
Ophthalmologist visit	0.184	0.582	0.356	0.240	0.329

[a]*Females compared to males. BP = blood pressure. HbA_{1c} = glycosylated haemoglobin. LDL = low-density lipoprotein cholesterol.*

Table 4. Regression values for the quality indicator of HbA_{1c} <7 mg%.

R^2 = 0.2030	Coefficient	95% CI
Sex	–0.08	–0.23 to 0.08
Age	0.0004	–0.00006 to 0.007
Low SES	–0.29	–0.41 to –0.16
New immigrant	0.18	0.06 to 0.29
BMI	–0.01	–0.02 to –0.001

BMI = body mass index. SES = socioeconomic status.

Table 5. Regression values for the quality indicator of blood pressure <130/80 mmHg.

	Coefficient	CI
Sex	0.12	–0.13 to 0.38
Age	–0.009	–0.01 to –0.002
Low SES	0.06	–0.14 to 0.27
New immigrant	–0.08	–0.26 to 0.11
BMI	–0.009	–0.02 to 0.005

BMI = body mass index. SES = socioeconomic status.

status, new immigrants, and BMI, (Table 3), a lower quality indicator score of HbA_{1c} <7 mg% was correlated with a higher percentage of patients of low socioeconomic status (P<0.001), a higher percentage of new immigrants (P = 0.002), and higher patients' BMI (borderline significance (P = 0.024), (Table 4).

Patient age was negatively correlated with achieving blood pressure <130/80 mmHg (P = 0.006). None of the patients' characteristics were related to achieving LDL-cholesterol <100 mg/dl, (Table 5).

Performance measures. In the multivariate regression model, none of the patients' characteristics were related to the percentage of patients who had HbA_{1c}, LDL-cholesterol, microalbumin, fundus examination, or blood pressure measurements in the previous year, (Table 3).

DISCUSSION

Summary of main findings

The characteristics of patients with diabetes were found to be correlated with QIs of diabetes control but not to QIs of diabetes follow-up. Physicians' lists characterised by patients with diabetes with a higher percentage of new immigrants and patients from low socioeconomic status were correlated with a lower percentage of patients achieving an HbA_{1c} <7 mg%. Higher patients' age was correlated with a lower percentage of patients achieving blood pressure <130/80 mmHg.

Strengths and limitations of the study

Since this study is based on computerised data, no information was available about the physicians' clinical judgment regarding any specific patient. Physicians may target higher HbA_{1c} according to patients' clinical conditions as in the case of patients with other serious diseases, very old age, or partial compliance.

Another limitation is that as a cross-sectional study, the results represent outcomes of only one year. There can be yearly variability in quality outcomes across health authority areas.[12] The large number of practices used in the study may compensate for this variability.

The major strength of this study is the comprehensiveness of the Clalit Health Service database. This unique database had enabled creation of an accurate patient profile for each practice, and comparison of different physicians' lists.

Comparison with existing literature

Patients in Clalit Health Service have free access to their primary care physician with no co-payment, and no further co-payment is needed for blood tests; this may explain why patients' characteristics were not related to any of the diabetes follow-up QIs. Despite universal access to care, age, low

socioeconomic status, and immigration and other markers of poor social support (older age and new immigrants) still play a key role in diabetes outcome measures. Similar results were noted with the introduction of pay for performance in the UK, which improved diabetes management but was not sufficient to bridge ethnic disparities in outcome measures.[13] Further research is needed to reveal the factors that could compensate for health disparities in these groups.

Implications for clinical practice

The use of computerised data has created an opportunity to follow physician performances and to map disparities between practices.

Despite the universal access to medical care, achieving good glycaemic control is highly dependent on patients' characteristics. New immigrants, patients of low socioeconomic status, and older patients need special attention and increased resources to decrease the disparities in health.

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Ethics committee
The ethics committee of Meir Medical Center, Kfar Saba, Israel gave approval.

Competing interests
The authors have stated that there are none.

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