

Associations between technical quality of diabetes care and patient experience

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Abstract

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Aims It has long been held that high-quality care has both technical and interpersonal aspects. The nature and strength of any association between both aspects remain poorly explored. This study investigated the associations between diabetes patients' reports of receiving recommended care (as measures of technical quality) and their experience and ratings (as measures of interpersonal care).

Methods Using data from a cross section of 3096 patients with diabetes nested within 24 diabetes-care-networks, we conducted multilevel regression analysis of the relationships between nine indicators of receiving care recommended in practice guidelines and: six scales of patient experience and global ratings of general practitioner, nurses, and overall diabetes care.

Results On average, reporting having received recommended care was associated with reporting better patient experience and ratings. The extent and frequencies of these associations varied across the different care processes. Receiving foot examination, physical activity advice, smoking status check, eye examination, and HbA_{1c} testing, but not nutritional advice, urine, cholesterol or blood pressure checks, were statistically associated with better patient experience and global ratings. Those who received HbA_{1c} testing rated their overall care 1.002 points higher (95% confidence interval: 0.726–1.278) on a scale of 0–10 than those who did not.

Conclusions Higher self-reported technical quality of care in diabetes appears to be frequently but not always associated with better experiences and ratings. It is possible that the former leads to the latter and/or that both share a common cause within providers. Both care aspects do not seem interchangeable during performance assessment.

Introduction

Many health-care systems increasingly require systematic assessments of both technical quality of care and interpersonal care.^{1,2} This is particularly true for chronic conditions such as diabetes mellitus where patients who enjoy both better technical and interpersonal care seem to have better outcomes.^{3–6} The technical quality of care is often captured with process and outcome measures of effective, appropriate and safe care. Interpersonal care is usually operationalized as patient-centredness, quantified using measures of patient satisfaction and, more recently, patient experience.^{3–6} In principle, technical care and interpersonal care constructs tap into different aspects of care.^{1,2}

Research shows mixed evidence of positive correlations between technical quality of care and measures of interpersonal care across different conditions including diabetes.^{3–5,7} For instance, in a recent American study, Ackermann *et al.* found that a higher number of documented diabetes process-of-care indicators was associated with increased patient satisfaction and overall rating of care experience.³ In Israel, Gross *et al.* found that patients who reported receiving diabetes care recommended in practice guidelines were more likely to be satisfied with their care.⁶ Yet, other researchers did not find significant associations between the use of practice guidelines and subsequent patient satisfaction among patients with diabetes.⁷ These results appear not to differ by whether the studies used either self-reporting or independently documented measures of technical quality.^{3,5–10} It, therefore, remains unclear whether patients who are treated according to diabetes practice guidelines also consistently have better care experience and rate their care higher in different settings.

This Dutch study investigated whether type 2 diabetes patients who reported having received better technical quality of care also reported better experiences and rated their care higher. Receiving recommended care and having dignified patient experiences in the process are both laudable outcomes valued by patients, clinicians,

insurers and policymakers, irrespective of whether one leads to the other.^{1–12} Hence, the findings of this study may be of interest to patients, clinicians, insurers and policymakers.

Patients and methods

We used secondary data from a 2007 cross-sectional survey of Dutch patients aged 18 years or older, with type 2 diabetes mellitus, sampled from 24 diabetes-care-networks. In the Netherlands, a diabetes-care-network is a practice consortium of general practitioners, nurses, dieticians and other providers who manage the chronic care of patients with diabetes within any given community.¹³ The concept of the diabetes-care-network is akin to a 'medical home' for those diagnosed with diabetes mellitus within local geographic regions of the Netherlands. In the recently reformed Dutch health-care system featuring managed competition and compulsory basic health insurance for all, insurers who contract diabetes-care-networks to provide high-quality care to their consumers need reliable and valid data on patient-centredness and other performance dimensions for informed decision making and pay-for-performance contracting.^{14,15} This managed competition has spurred the development of a family of patient experience surveys, including the one used here, which are partly based on the family of Consumer Assessment of Healthcare Providers and Systems® (CAHPS) instruments used in the United States.^{3,8,15–17} Earlier publications have shown the Dutch instruments to be as reliable and valid as their United States counterparts.^{15,16}

For this study, the sites for the patient experience survey of diabetes patients using the Consumer Quality Index Diabetes® (CQI-Diabetes) instrument included 24 diabetes-care-networks each serving at least 80 patients.¹³ A random sample of 300 patients aged 18 years and above was drawn from the health-insurance claims database covering the patient population of each diabetes-care-network. For diabetes-care-networks serving 80–300 patients, all their patients were included in the survey. In total, 8698 patients were included in the survey. The

survey was administered by mail in 2007 and could involve up to four mailings including reminders. The first mailing pack included a stamped addressed envelope, instructions, and a cover letter explaining the purpose of the survey, requesting consent and guaranteeing confidentiality. In a second wave of mailing 1 week later, all potential respondents were followed up with a postcard thanking them and encouraging them to respond to the survey if they had not done so already. A third mailing in the 5th week was a re-posting of the first mailing pack to non-respondents. The fourth mailing by the 7th week also targeted non-respondents using a reminder postcard.¹³ Participants were not compensated.

The survey instrument CQI-Diabetes contained 96 items.¹³ These items included core questions on patient experience, three global ratings (of general practitioners, nurses and diabetes-care-network), questions about receiving recommended care, items on knowledge of diabetes, and several items on patient demographics. Previous psychometric analysis yielded six domains of patient experience based on 22 items in the CQI-Diabetes (Table S1). Cronbach's alpha for the internal consistency of the scales ranged from 0.73 to 0.87, where 0.70 or higher was regarded as evidence of reliability.^{13,15,16} The psychometric validation study underpinning the instrument was reported elsewhere as a peer-reviewed technical report.¹³

The nine outcome measures used in this study were the six domains of patient experience and the three global ratings. The six patient experience domains were averaged scale scores of the 22 items which had the highest factor loadings on those latent domains (Table S1). All 22 patient experience items were evaluated on a 1-to 4 response scale, where 1 referred to 'never,' 2 'sometimes,' 3 'usually,' and 4 'always.' The corresponding six domains were (i) communication with general practitioner, (ii) communication with nurses, (iii) diabetes-specific communication, (iv) courtesy of other staff, (v) experiencing no language problems during consultation, and (vi) coordination of care among network providers. The remaining outcomes were the three global ratings of (i) general

practitioner, (ii) nurses, and (iii) overall diabetes care, each of which was measured on a scale of 0 ('worst possible') to 10 ('best possible').¹³ For example, each respondent was asked 'Using the scale below, please rate your overall diabetes care, where 0 is the 'worst possible diabetes care' and 10 the 'best possible diabetes care'. All nine outcome variables were treated as continuous measures, where higher scores represented better experiences or ratings.

The main predictors used in this study were nine patient reports of whether (yes or no) they received the following care processes indicative of the technical quality of their care: (i) nutritional advice within the last 12 months, (ii) physical activity within the last 12 months, (iii) smoking status check for possible counselling within the last 12 months, (iv) HbA_{1c} testing within the last 12 months, (v) cholesterol check within the last 6 months, (vi) urine test within the last 6 months, (vii) foot examination within the last 12 months, (viii) eye examination within the last 12 months, and (ix) blood pressure check within the last 12 months. These measures were formulated from recommended processes of care found in clinical guidelines for diabetes care.^{3,4,11,13} We also included data on potential confounders, namely age, sex, duration of diabetes, education attainment, ethnicity and general health status (Table 1).

We conducted three types of data analysis. First, we used descriptive statistics to summarize the study population and estimate the proportion of those who received recommended care. Second, we used linear multilevel regressions^{6-10,12-19} to investigate the relationships between each of the nine measures of recommended care and each of the nine outcomes, adjusting for potential confounding effects of age, sex, duration of diabetes, education attainment, ethnicity, self-rated general health status. Multilevel regression is the appropriate statistical tool for analysing patient experience data collected from multiple facilities.¹⁷⁻¹⁹ In these patient experience surveys, patients are clustered within facilities – in this study, within diabetes-care-networks – whereby patient observations within each institution are correlated.¹⁷ This within-

network clustering of observations can lead to artificially inflated standard errors and hence overly optimistic findings.^{17–19} Multilevel regression is a generalized framework, of which traditional linear regression is a special case, for correcting clustering of observations thus allowing for unbiased hypothesis testing. We fit models in which measures of recommended care had similar associations with the outcome measures of patient experience across all diabetes-care-networks. If we had more diabetes-care-networks than the current 24, multilevel regression would also have been a flexible analytical framework for allowing those associations to vary across networks.¹⁸

Third, we conducted sensitivity analysis to gauge the impact of missing data, uncontrolled confounders, and non-response bias on our findings. The multilevel regression we used was flexible in handling ‘missingness’, where we assumed that data were missing-at-random given the other observed information (including patient demographics) in our models.^{17,18} Nonetheless, we still used multiple imputations to cross-validate our findings.¹⁸ Given the self-reporting of both the outcomes and predictors in this study, it is conceivable that any association between them could be due to uncontrolled confounding from, say, an unobserved propensity of respondents to recall better experience whenever they reported receiving recommended care. Therefore, we used bias formulas for uncontrolled confounding and possible non-response bias to quantify such unobserved effects externally.^{20,21} Although the sensitivity analyses are not detailed here because of their technical complexity for a general audience, we summarize the findings below and in the appendix online. The technical methods of how to implement such analysis are detailed elsewhere.^{20,21} All analyses were conducted in SAS[®] software version 9.1.3 (SAS Institute Inc, Cary, NC, USA).²²

Results

After excluding patients who declined, returned empty surveys, for whom someone else responded on their behalf, or who were missing

more than half survey items as per protocol,^{15–17} 5438 patients were deemed respondents: 62.5% net response.¹³ Because of Dutch privacy laws, only age and sex comparisons were possible for the non-response analysis.¹⁵ As in other patient surveys,^{8,10,15,16} there were slightly fewer males (44% vs. 47%), hence more females (56% vs. 53%, P value = 0.01) among the respondents than among the non-respondents.¹³ Respondents were also on the average 3 years younger than non-respondents ($P < 0.001$). Further exclusion of respondents with missing data on the key outcomes and predictors used in this study yielded an analytical sample of 3096 respondents. Those so excluded did not differ significantly from those in the final analytical sample.

The characteristics of the responding patients included in this study are presented in Table 1. About four of five patients were aged between 45 and 79 years, 89% had been diabetic for more than a year, and about three of five rated their health as good, very good or excellent. Averaged over all 24 diabetes-care-networks, only 47% of patients reported having had urine testing within the previous 6 months, 72% reported receiving foot examination in the previous 12 months, and almost 98% reported having their blood pressure checked in the preceding 12 months (Table 1). Care aimed at lifestyle such as nutrition (37%), physical activity (52%), and smoking (64%) were among the least received recommended care. About 95% of the patients reported having their HbA_{1c} level checked in the preceding 12 months.

Tables 2 and 3 present the results of the multivariate multilevel regression analysis showing that although, on average, reporting having received recommended care was associated with reporting better patient experience and ratings, the extent and frequencies of these associations varied across the different care processes. Each regression coefficient in Tables 2 and 3 represents the absolute amount by which the corresponding patient experience on a scale of 1–4 or global rating on a scale of 0–10 increased among those who received recommended care vs. those who did not. Table 2 displays the results of the adjusted associations between each recom-

Table 1 Characteristics of respondents

Variables	<i>n</i>	Percentage or mean
Age		
18–44 years	123	4.0
45–64 years	1331	42.9
65–79 years	1387	44.8
80 years or older	255	8.3
Sex (female)	1639	52.8
Ethnicity		
Other Western	75	2.4
Other non-Western	55	1.8
Turk	41	1.3
Moroccan	46	1.5
Surinamese, Antillean or Aruban	159	5.1
Indonesian	63	2.0
Dutch	2657	85.8
Educational attainment		
Lower secondary or less	2432	78.5
Upper secondary	423	13.7
College or university	186	1.7
Other	53	6.0
Duration of diabetes (more than 12 months)	2769	89.4
Self-rated general health		
Fair or poor	1200	38.8
Excellent, very good, or good	1896	61.2
Recommended diabetes care		
Nutritional advice within last 12 months	1113	36.6
Physical activity advice within last 12 months	1607	51.9
Asked if a smoker within last 12 months	1991	64.3
Haemoglobin A _{1c} (HbA _{1c}) level checked within last 12 months	2941	95.0
Cholesterol level checked within last 6 months	1926	62.2
Urine test within last 6 months	1446	46.7
Foot examination within last 12 months	2238	72.3
Eye examination within last 12 months	2158	69.7
Blood pressure check within last 12 months	3018	97.5

Total sample *N* = 3096.

mended care and the six patient experience domains, namely communication with general practitioner, communication with nurses, diabetes-specific communication, courtesy of other staff, no language problems during consultation, and coordination of care among providers.

Table 3 presents the associations between each recommended care and the three global ratings of doctor, nurses and overall care. Among all nine recommended care processes, receiving foot examination had the most frequent associations (eight of nine) with patient experience scales and global ratings, with significant regression coefficients ranging from 0.050 ($P = 0.04$) for its relationship with ‘courtesy of staff’ to 0.581 ($P < 0.001$) for its association with global rating of overall diabetes care. Smoking status and HbA_{1c} level checks were each positively associated with six of the nine patient experience and global rating outcomes. Those patients who reported receiving physical activity advice were also more likely to report better experiences in five domains and to rate their overall care higher. Notably, those who received HbA_{1c} testing rated their overall care by 1.002 points higher (95% CI 0.726–1.278, $P < 0.001$) on a scale of 0–10 than those who did not (Table 3).

All else being equal, receiving all nine recommended care as against not receiving any increased the patients’ rating of their overall diabetes care by nearly 2.83 points (95% CI 2.27–3.39) on a scale of 0–10 (obtained by summing up the nine regression coefficients in the last column of Table 3). Recommended care measures were most frequently associated with diabetes-specific communication (eight of the nine possible associations) and global rating of overall diabetes care (six associations).

We found no differences in results when we handled patient experience scales as categorical outcomes and applied multinomial or logistic multilevel regressions. Multiple imputation analysis did not qualitatively alter our findings (Table S2). Nor did external adjustments and probabilistic sensitivity analysis for uncontrolled confounding and non-response bias under varying scenarios using programming procedures reported elsewhere.^{20,21}

Discussion

We found several instances where diabetes patients who reported receiving recommended care also reported better experiences and higher

Table 2 Associations between patient reports of receiving recommended care and their experiences of diabetes care

	Communication with general practitioner	P value	Communication with nurses	P value	Diabetes-specific communication	P value	Courtesy of other staff	P value	No language problems during consultation	P value	Coordination of care among providers	P value
Nutritional advice within last 12 months	0.001 ± 0.025	0.97	0.007 ± 0.017	0.69	0.110 ± 0.027	<0.001	-0.013 ± 0.024	0.58	-0.022 ± 0.043	0.60	0.030 ± 0.052	0.57
Physical activity advice within last 12 months	0.008 ± 0.025	0.76	0.049 ± 0.018	0.006	0.152 ± 0.027	<0.001	0.054 ± 0.024	0.02	0.150 ± 0.043	<0.001	0.094 ± 0.054	0.08
Asked if a smoker within last 12 months	0.067 ± 0.023	0.003	0.029 ± 0.017	0.08	0.169 ± 0.025	<0.001	0.072 ± 0.022	0.001	-0.002 ± 0.040	0.97	0.207 ± 0.050	<0.001
Haemoglobin A _{1c} (HbA _{1c}) level checked within last 12 months	0.029 ± 0.056	0.60	0.108 ± 0.043	0.01	0.285 ± 0.063	<0.001	0.024 ± 0.055	0.65	0.078 ± 0.100	0.43	0.633 ± 0.127	<0.001
Cholesterol level checked within last 6 months	0.025 ± 0.025	0.31	0.028 ± 0.018	0.12	0.017 ± 0.028	0.55	0.025 ± 0.024	0.30	0.040 ± 0.044	0.36	0.024 ± 0.055	0.67
Urine test within last 6 months	0.057 ± 0.023	0.015	0.016 ± 0.017	0.358	0.062 ± 0.027	0.020	0.014 ± 0.023	0.55	-0.006 ± 0.042	0.88	0.042 ± 0.051	0.42
Foot examination within last 12 months	0.041 ± 0.026	0.111	0.116 ± 0.020	<0.001	0.282 ± 0.029	<0.001	0.050 ± 0.025	0.04	0.170 ± 0.045	<0.001	0.310 ± 0.058	<0.001
Eye examination within last 12 months	0.031 ± 0.024	0.19	0.034 ± 0.017	0.04	0.069 ± 0.027	0.009	0.040 ± 0.023	0.08	0.026 ± 0.042	0.54	0.184 ± 0.053	<0.001
Blood pressure check within last 12 months	0.007 ± 0.077	0.93	0.027 ± 0.063	0.68	0.258 ± 0.085	0.002	-0.125 ± 0.075	0.07	0.199 ± 0.142	0.17	0.162 ± 0.181	0.37

Data are regression coefficient ± SD unless otherwise indicated. Each outcome model was adjusted for age, sex, education, ethnicity, duration of diabetes and self-rated general health.

care ratings in diabetes-care-networks in the Netherlands. Receiving foot examination, physical activity advice, smoking status check, eye examination, and HbA_{1c} testing, but not nutritional advice, urine, cholesterol or blood pressure checks, were statistically significantly associated with better patient experience and ratings of care. Those who received recommended care, except nutritional, urine and cholesterol checks, rated their overall diabetes care higher than those who did not.

Like most observational studies, both our outcomes and predictors are self-reported. This self-reporting can exaggerate or even attenuate the observed associations if there is an unknown propensity of the respondents to respond to the questions on receiving recommended care and their experiences in a biased manner. This would result in what is known as differential information bias or measurement error in the variables for self-reported quality of care. This would be an important limitation in our study if not for the fact that the study variables, with the exception of the three global ratings, are all reports asking patients what happened, not evaluations asking them to rate what happened.^{3,15–17} Patient reports such as patient experience reports (as used in this study and which have been gaining prominence in the literature) are considered less subjective than patient evaluations or judgments such as satisfaction.^{8,9,23} Although the three global ratings we used among the nine outcomes were evaluations (Table 3), all three ratings displayed associations with recommended care as (in)frequently as did reports of patient experience (Tables 2 and 3). Moreover, our findings mirror those of other studies that used self-reporting and medical chart abstracting for documented measures of technical care,^{3,5,7,10,12} thus lending support to the lack of substantial bias in our study arising from self-reporting.²³ Another related criticism of self-reporting could be uncontrolled confounding where patients who had better experience and rated their care highly would be more knowledgeable about their care. Furthermore, our study used reporting questions based on practice guidelines which patients

Table 3 Associations between patient reports of receiving recommended care and their global ratings of providers and overall diabetes care

	Global rating of general practitioner	P value	Global rating of nurses	P value	Global rating of overall diabetes care	P value
Nutritional advice within last 12 months	0.005 ± 0.064	0.94	0.045 ± 0.053	0.40	0.073 ± 0.061	0.24
Physical activity advice within last 12 months	0.047 ± 0.064	0.47	0.096 ± 0.055	0.08	0.209 ± 0.062	<0.001
Asked if a smoker within last 12 months	0.132 ± 0.059	0.03	0.084 ± 0.051	0.10	0.181 ± 0.057	0.001
Haemoglobin A _{1c} (HbA _{1c}) level checked within last 12 months	0.362 ± 0.146	0.01	0.334 ± 0.134	0.01	1.002 ± 0.141	<0.001
Cholesterol level checked within last 6 months	0.185 ± 0.064	0.004	0.107 ± 0.055	0.05	0.092 ± 0.062	0.14
Urine test within last 6 months	0.086 ± 0.061	0.16	0.055 ± 0.053	0.30	0.065 ± 0.060	0.28
Foot examination within last 12 months	0.206 ± 0.067	0.002	0.340 ± 0.061	<0.001	0.581 ± 0.064	<0.001
Eye examination within last 12 months	0.091 ± 0.061	0.14	0.026 ± 0.053	0.63	0.129 ± 0.060	0.03
Blood pressure check within last 12 months	0.010 ± 0.198	0.96	0.267 ± 0.196	0.17	0.498 ± 0.190	0.009

Data are regression coefficient ± SD unless otherwise indicated. Each outcome model was adjusted for age, sex, education, ethnicity, duration of diabetes and self-rated general health.

did not have to be knowledgeable about before responding to the straightforward questions on whether they received the recommended care or not. Additional sensitivity analysis using some data on patient knowledge of diabetes did not alter these findings (Table S3). Nonetheless, as in every observational study, we admit that we cannot with certainty rule out all sources of potential bias in this study. Finally, we caution that our instrument like many others cannot be seen as capturing every important conceptualization of patient-centredness. Patient reports of experiences with care providers can shed light on providers' interpersonal care skills in meeting patients' needs, sensitivities, and preferences. Interpersonal care is central to delivering patient-centred care.

This large Dutch study corroborates two previous studies showing that higher number of documented care processes and physicians' adherence to diabetes care guidelines were both associated with higher patient experience or satisfaction and global ratings.^{3,6} Three possible explanations are relevant here. First, providers who were more likely to give recommended care (better technical quality) were also better at providing good patient experience (better interpersonal care). That is, top-performing network providers were probably good at the 'what' (technical) and 'how' (interpersonal skills) aspects of diabetes care. Second, patients who reported receiving recommended care perhaps rewarded their providers and networks with higher ratings. It would still be a good and valued outcome for patients and providers^{1-3,11} if receiving recommended care is often associated with better patient experience irrespective of whether one leads to the other or both share a common cause such as the likelihood of providers to be good in both. Therefore, when clinicians strive to provide good technical care, they might inadvertently be increasing their interpersonal care skills, or patients might reward them for the effort with good experience scores and ratings, or even both. Third, patients who experienced better interpersonal care from their doctors were more likely, perhaps over time, to comply with recommended care.

A clinical implication of this study is that providing high-quality technical care does not seem to come at the cost of being patient-centred. The recommended care processes we examined in this study are recognized as being central to the management of diabetes, especially the secondary prevention of its many complications.²⁴⁻²⁷ It is still important to investigate how to maximize both technical and interpersonal care during the chronic management of diabetes. Diabetes can be a debilitating chronic disease if not well managed and its successful management partly hinges on securing patient compliance and trust.^{3-6,11} Ensuring good interpersonal care can go a long way in securing patient compliance which in turn might improve health-care outcomes substantially.

The observation that measures of technical care were not perfectly correlated with those of interpersonal care implies they are not interchangeable in performance assessment including pay-for-performance initiatives.^{1,2} Given that receiving recommended care and having dignified patient experiences in the process are both laudable outcomes valued by patients, clinicians, insurers, and policymakers,^{1-12,27-29} both types of measures are still needed for improving the quality of care for patients with diabetes.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Brief description of scales representing domains of patient experience of diabetes care and items loaded on each scale.

Table S2. Associations between patient reports of receiving recommended care and their global ratings of providers and overall diabetes care, combining the results of five imputed datasets.

Table S3. Associations between patient reports of receiving recommended care and their global ratings of providers and overall diabetes care, adjusted for respondents' diabetes knowledge.

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