ORIGINAL ARTICLE

Patient-Centered Care, Glycemic Control, Diabetes Self-Care, and Quality of Life in Adults with Type 2 Diabetes

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Abstract

Background: The Affordable Care Act places a newfound emphasis on patient-centered medical home and patient-centered care (PCC). The purpose of this study was to evaluate the relationship between PCC, diabetes self-care, glycemic control, and quality of life (QOL) in a sample of adults with type 2 diabetes.

Methods: Six hundred fifteen patients were recruited from two adult primary care clinics in the southeastern United States. Primary outcome variables were self-care behaviors (medication adherence, diet, exercise, blood sugar testing, and foot care), glycemic control, and QOL (physical component summary [PCS] score and mental component summary [MCS] score of SF12). PCC was assessed using a modified 7-item Picker Patient Experience Questionnaire. Regression modeling was used to assess independent associations while adjusting for relevant covariates.

Results: In adjusted analyses, PCC was significantly associated with PCS QOL ($\beta = -0.03$, 95% confidence interval [CI] -0.05 to -0.01), MCS QOL ($\beta = 0.09$, 95% CI 0.04 – 0.14), medication adherence ($\beta = 0.12$, 95% CI 0.08 – 0.17), general diet ($\beta = 0.12$, 95% CI 0.07 – 0.17), specific diet ($\beta = 0.05$, 95% CI 0.01 – 0.08), blood sugar testing ($\beta = 0.09$, 95% CI 0.04 – 0.15), and foot care ($\beta = 0.12$, 95% CI 0.07 – 0.18).

Conclusion: PCC is associated with diabetes self-management and QOL, but was not significantly associated with glycemic control in patients with diabetes. PCC may be an important factor in self-care behaviors, but the process of focusing care around the patient may need to expand throughout the healthcare system before changes in outcomes such as glycemic control are noted.

Introduction

THE MOST RECENT REPORT by the United States Centers for Disease Control (CDC) estimates that as of 2014, 29.1 million people (9.3% of the U.S. population) have been diagnosed with diabetes.¹ In addition, the International Diabetes Federation (IDF) indicates that diabetes affected 387 million people worldwide in 2013, a number that is projected to increase to 592 million by 2035.² The emerging diabetes epidemic is attributed to shifting lifestyles worldwide and is largely driven by modifiable risk factors, particularly decreasing physical activity and increasing obesity.^{3–5} Various macrovascular and microvascular complications introduce a

significant burden, both social and economic, and claims have been made that diabetes is one of the world's most important causes of expenditure, mortality, disability, and economic loss.^{3,6–8} Not only does diabetes result in high levels of premature mortality, but it also leads to prolonged disability, productivity loss, and stunted socioeconomic growth.⁹ These alarming statistics call for the implementation of an effective treatment plan for type 2 diabetes, which accounts for 90%–95% of all cases of diagnosed diabetes.^{1,2}

Patient-centered care (PCC) is a prominent and emerging healthcare reform effort designed to provide respectful and preferential care that aligns with personal values in decision-making.¹⁰ Patient-centeredness seeks to improve the functioning

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of healthcare organizations, and ultimately improve health outcomes of noncommunicable diseases such as diabetes.^{11,12} The precise definition can vary depending on context; however, PCC is generally conceptualized as the merging of patient education, self-care, and evidence-based models of practice.^{11,13,14} This often consists of four broad domains: communication, partnerships, health promotion, and physical care.^{11,13,14} Existing literature advocates a patient-centered approach through bolstered patient-provider relationships and communication as a means to improved patient satisfaction and medical outcomes.¹⁴ However, empirical evidence for the role of PCC in patient outcomes is mixed.^{15,16} Previously conducted research studies of patients with diabetes show long-term PCC interventions are significantly associated with the mental component of quality of life (QOL), improved cardiovascular risk control, and self-management, but result in minimal to no significant differences in physical QOL and glycemic control.^{13,17} Others suggest that PCC may only be effective at certain glycosylated hemoglobin A1c (HbA1c) levels and/or risk profiles.¹⁸

Our study sought to understand the relationship between glycemic control and PCC to better determine its legitimacy as a means of improving care for patients with type 2 diabetes.¹⁶ Our study included a large percentage of non-Hispanic Blacks for whom the risk of diabetes diagnosis is 77% greater compared to non-Hispanic White adults.^{1,2,19} We aimed to determine the existing relationships between PCC and self-care behaviors (medication adherence, diet, exercise, blood glucose testing, and foot care), glycemic control (HbA1c), and QOL (physical and mental components). We hypothesized that more patient-centered care would be associated with more diabetes knowledge, better self-care, improved glycemic control, and higher QOL.

Materials and Methods

Study population

Our study population included adults who were aged 18 years or older, had a diagnosis of type 2 diabetes in their medical record, and were able to communicate in English. Patients were excluded if cognitive impairment due to dementia or active psychosis was present, as determined by chart documentation or interaction. Letters were sent to eligible patients, or patients were approached in clinic at two adult primary care clinics in the southeastern United States. Research coordinators explained study procedures and consented patients interested in participating in the study. The local Institutional Review Board approved all study procedures before study recruitment and enrollment.

Patients completed validated questionnaires with information on demographics, social determinants of health, self-care behaviors, and comorbidities. Questionnaires assessing the social determinants of health were selected based on an adaptation of the conceptual framework by Brown et al.²⁰ elucidating pathways linking social determinants of health with outcomes in patients with type 2 diabetes. The most recent HbA1c, used to measure glycemic control, was abstracted from the medical record.

Demographic covariates

Previously validated items from the 2002 National Health Interview Survey²¹ were used to collect general demographic

and socioeconomic information, including age, race, gender, years of education, marital status, income level, and employment status. Duration of diabetes was collected by patient self-report, as was perceived health status, which was collected using a standardized question with response options on a scale of 1 to 5 with 1 being low and 5 being high.²¹ Medical comorbidity was collected and calculated using the Charlson comorbidity index.²²

Patient-centered care

PCC was assessed using seven questions from the Picker-Commonwealth Survey of Patient-Centered Ambulatory Care, which was adapted from the Picker Commonwealth Survey of Hospital Care.^{23,24} The patients' experiences with physicians during visits for care were measured to determine best practices for making and sustaining advancements in their personal experiences with care. Patients were asked if they (1) got enough time to explain the reasons for their visits, (2) received answers that were understandable when asking questions, (3) felt the physician had enough time to answer their questions, (4) were asked about how their personal contacts or living arrangements affected their health, (5) obtained the perceived necessary amount of information from their providers, (6) had questions about their care they did not get to ask the physician, and (7) were involved in decision-making about their care as much as they would like. The answer choices were "always," "usually," "sometimes," and "never." The Picker-Commonwealth Survey of Patient-Centered Ambulatory Care was analyzed as a continuous measure with scores ranging from 7 to 28, with the higher number representing more PCC. This instrument is used as a continuous measure (without a specific cutpoint) and is not designed to stratify populations as being patient-centered or not. Instead, it is used to assess degree or level of PCC on a continuous scale. In addition, there is no previously validated dichotomous cutpoint.

Self-care variables

Diabetes behavioral skills were assessed using the Summary of Diabetes Self-care Activities (SDSCA): an 11-item scale measuring the frequency of conducting self-care activities in the last 7 days. Activities included were general diet (following a healthy diet), specific diet (eating fruits and vegetables and high-fat foods), exercise, blood glucose testing, and foot care.²⁵ Medication adherence was assessed using the Morisky Medication Adherence Scale (MMAS): an 8-item scale with higher values indicating poorer adherence.²⁶ Diabetes knowledge was measured using the 24-item Diabetes Knowledge Questionnaire (DKQ).²⁷ The DKQ has a reliability coefficient of 0.78 and showed sensitivity to a diabetes knowledge intervention. In addition, it targeted knowledge deficits, which can be related to measurable outcomes, false statements, or those known to be common and/or serious misconceptions, and it has been tested in an ethnic minority group.

Outcomes

QOL was assessed using the SF-12: a 12-item scale providing a summary of physical health (PCS-12) and mental health (MCS-12) component outcome scores. The SF-12 is a

TABLE 1. SAMPLE CHARACTERISTICS (N=615)

Continuous demographic variables (mean $\pm$ standard deviation)	
Age	61.3 $\pm$ 10.9
Number of years in school	13.4 $\pm$ 2.8
Number of hours worked per week	12.5 $\pm$ 19.0
Duration of diabetes	12.3 $\pm$ 9.1
Charlson comorbidity score	25.7 $\pm$ 2.2
Categorical demographic variables (%)	
Gender	
Female	38.4
Male	61.6
Race/Ethnicity	
Non-Hispanic White	33.0
Non-Hispanic Black	64.9
Hispanic/other	2.1
Marital status	
Never married	11.2
Married	49.7
Separated/divorced	28.2
Widowed	10.9
Annual household income	
<\$20,000	41.6
\$20,000–\$49,999	38.9
\$50,000–\$74,999	10.1
$\geq$ \$75,000	9.4
Health status	
Excellent	1.3
Very good	12.0
Good	38.9
Fair	38.2
Poor	9.6
Site	
Academic Medical Center	51.2
Veterans Affairs Medical Center	48.8

valid and reliable instrument ($\alpha=0.89$) and is widely used due to its outcome scores being interchangeable with the longer SF-36 version in both general and disease-specific populations.^{28,29} Questions used in the physical component summary (PCS) score ask how often physical health limits activities, such as moving a table or climbing several flights of stairs. Questions used in the mental component summary (MCS) score ask how often any emotional problems, such as feeling depressed or anxious, lead to accomplishing less than one would like, or made it so the respondent did not do other activities as carefully as usual. Hemoglobin A1c was abstracted from the medical record using the most recent values relative to the date of completed survey within the past 6 months.

Statistical analyses

After testing for normal distribution, means and percentages for all variables were calculated, including the PCC index. Unadjusted correlations were run to examine the relationship between PCC, glycemic control, QOL, and self-care behaviors. Next, fully adjusted multiple linear regression models were run to assess associations between the primary dependent variable PCC, glycemic control, QOL, and self-care variables, adjusting for relevant covariates, including race/ethnicity, age, gender, marital status, diabetes duration, education, employment, income, health status, comorbidity burden, and study site. Separate multiple linear regression

models were run for each self-care behavior (general diet, specific diet, exercise, blood sugar testing, foot care, and medication adherence), and outcome (HbA1c, PCS, and MCS) as the dependent variables, and PCC as the primary independent variable, adjusting for covariates. A two-tailed alpha of 0.05 was used to assess statistical significance. All analyses were performed using Stata Version 13.

Results

Table 1 shows the sample characteristics of this population of 615 adults with type 2 diabetes. The mean age of the participants was 61 years old (range 24–94 years old), with the majority being men (62%) and Non-Hispanic Black (65%). Approximately 50% were married, and 42% had an annual household income <\$20,000. A total of 77% rated their health as good or fair. Forty-two percent of the sample was not well controlled, having an HbA1c $\geq$ 7%.

Table 2 shows the mean scores for the PCC, diabetes knowledge, self-care behaviors, glycemic control, and QOL. In this sample, the mean value for PCC was 23.7 $\pm$ 3.9, where PCC is scored on a range from 7 to 28, with the higher score representing more PCC. Of the self-care behaviors, exercise was performed the least at 2.6 $\pm$ 2.2 days; the remainder was done a minimum of 4 days. The average HbA1c for the sample was 7.9 $\pm$ 1.8.

Table 3 shows the correlation between PCC, glycemic control, self-care behaviors, and QOL. PCC was significantly correlated with all outcomes: glycemic control, self-care (medication adherence ($r=0.29$; $p<0.001$), general diet ($r=0.27$; $p<0.0001$), specific diet ($r=0.18$; $p<0.0001$), physical activity ($r=0.11$; $p<0.001$), blood sugar testing ($r=0.10$; $p=0.016$), foot care ($r=0.13$; $p=0.01$), and QOL. It was inversely related to glycemic control ($r=-0.14$; $p<0.001$) and physical QOL ($r=-0.11$; $p=0.007$) such that as higher PCC increased glycemic control and decreased physical QOL.

Table 4 shows results of the fully adjusted model for the relationship between PCC, glycemic control, self-care, and QOL. PCC was significantly associated with QOL and all self-care behaviors, except exercise ($\beta=0.04$, 95% confidence

TABLE 2. MEAN SCORES FOR PATIENT-CENTERED CARE, DIABETES KNOWLEDGE, SELF-CARE BEHAVIORS, GLYCEMIC CONTROL, AND QUALITY OF LIFE

Outcomes	Mean scores $\pm$ standard deviation
Patient-centered care	23.7 $\pm$ 3.9
Diabetes knowledge	15.9 $\pm$ 4.2
Self-care behaviors (over 7 days)	
Morisky medication adherence scale (0–8)	4.9 $\pm$ 2.0
General diet	4.7 $\pm$ 2.0
Specific diet	4.0 $\pm$ 1.6
Exercise	2.6 $\pm$ 2.2
Blood sugar monitoring	4.6 $\pm$ 2.5
Foot care	4.3 $\pm$ 2.0
Glycemic control	7.9 $\pm$ 1.8
Quality of life	
Physical component score	56.3 $\pm$ 1.0
Mental component score	56.6 $\pm$ 2.6

TABLE 3. CORRELATION BETWEEN PATIENT-CENTERED CARE, GLYCEMIC CONTROL, QUALITY OF LIFE, AND SELF-CARE BEHAVIORS

Outcome variables	Correlation, <i>r</i>	<i>P</i> ^a
Glycosylated hemoglobin A1c	-0.14	<0.001
Self-care behaviors		
Medication adherence	0.29	0.001
General diet	0.27	0.0001
Specific diet	0.18	0.0001
Exercise	0.11	0.001
Blood sugar monitoring	0.10	0.016
Foot care	0.13	0.001
Quality of life		
Physical component score	-0.11	0.007
Mental component score	0.27	0.0001

^aStatistically significant at *P* < 0.05.

interval [CI] -0.01 to 0.09). It was inversely associated with physical health QOL ($\beta = -0.03$, 95% CI -0.05 to -0.01); therefore, for each unit increase in PCC, the physical component score for QOL decreased by 0.03 units. In addition, PCC accounted for 11%–24% of the variance in self-care behaviors, with ~24% of the variance in medication adherence and 23% of the variance in general diet being due to PCC and additional covariates. PCC was not significantly associated with glycemic control or exercise.

Discussion

In this sample of adults with type 2 diabetes, PCC was significantly associated with QOL and self-care behaviors, adjusting for relevant confounding factors. In adjusted analyses, significant associations existed between PCC and both the physical and mental component of QOL, as well as with most self-care behaviors. However, PCC was not significantly associated with glycemic control or exercise.

TABLE 4. FULLY ADJUSTED LINEAR REGRESSION MODEL FOR THE EFFECT OF PATIENT-CENTERED CARE ON GLYCEMIC CONTROL, QUALITY OF LIFE, AND SELF-CARE BEHAVIORS

Outcome variables	β -coefficient	95% Confidence interval
Glycosylated hemoglobin A1c	-0.03	-0.07 to 0.01
Self-care behaviors		
Medication adherence	0.12 ^a	0.08 to 0.17
General diet	0.12 ^a	0.07 to 0.17
Specific diet	0.05 ^a	0.01 to 0.08
Exercise	0.04	-0.01 to 0.09
Blood sugar monitoring	0.09 ^a	0.04 to 0.15
Foot care	0.12 ^a	0.07 to 0.18
Quality of life		
Physical component score	-0.03 ^a	-0.05 to -0.01
Mental component score	0.09 ^a	0.04 to 0.14

^aStatistically significant at *P* < 0.05. Adjusted for race/ethnicity, age, sex, marital status, diabetes duration, education, employment, income, health status, comorbidity burden, and site.

Given the importance of self-care behaviors in maintaining glycemic control and limiting complications, these findings suggest a need for improved quality of care and focused patient-centered efforts in patients with specific risk profiles. It is important to identify potential barriers and obstacles experienced by patients when integrating self-care into their normal routines. Our findings that PCC is associated with better self-management behaviors are supported by evidence from previous studies. For example, in a study using a computer-assisted intervention to improve patient-centered diabetes care by increasing autonomy support, Williams et al. found the intervention resulted in improved diabetes self-management outcomes.³⁰ Self-care behaviors, including medication adherence, diet, blood sugar testing, and foot care, are imperative for effective management of type 2 diabetes. Thus, the positive relationship between PCC and self-care behaviors is promising. Improved patient-provider relationships as well as increased patient education and understanding of diabetes, support from providers and social networks, and involvement fostered by PCC are likely to contribute to increased awareness and adherence to self-care.

In our sample, PCC was no longer significantly associated with glycemic control after adjusting for appropriate confounders. Similar to our findings, a randomized control trial of PCC of diabetes in general practice assessed the effect on psychological and physiological outcomes in patients and found no significant differences in glycemic control.³¹ Slingerland et al. suggest that PCC is most beneficial in patients with an HbA1c > 8.5% as increased use of resources would result if efforts were focused on patients with higher risk profiles, who have the most to gain.¹⁸ Slingerland et al. further suggested that while PCC may be considered beneficial in patients with HbA1c of 7%–8.5%, the category in which the patients in this sample are included, it would not be as influential.¹⁸ Contrary to our findings, researchers found glycemic control improved by PCC when evaluating the efficacy of PCC in 78 patients with type 2 diabetes.³² These results may suggest that while more PCC influences self-care behaviors, it does not have enough of an impact to result in sustained behavior change and, thus, improved glycemic control. As healthcare systems are being redesigned to be more patient centric, it is important to ensure that all aspects address these needs, rather than simply one part of the medical care process. For example, systems that support patient autonomy, engaging and coordinating care with providers, and the ability to gather and use feedback, may be just as important as a patient-centered primary care visit.

QOL is equally important when it comes to treatment approaches. Both the physical and mental components must be taken into consideration. In a study to assess whether patient involvement is associated with higher satisfaction and empowerment, researchers found a positive relationship between being involved, satisfied, and empowered.³³ Their findings suggest that patient involvement offers an opportunity to enhance outcomes such as satisfaction and empowerment. In our sample, PCC is positively associated with the mental component, but negatively associated with physical QOL. Our findings suggest that while patients may benefit mentally from feeling empowered and participating in their own treatment processes, they may, in fact, feel overwhelmed, not be entirely capable of performing the tasks to meet provider expectations, or may even choose against the

most effective treatment recommended by their care providers causing their physical QOL and overall health to be negatively impacted. This is an important area of future work as both physical and mental components of QOL are important to promote. Understanding why this split exists may help in understanding the mechanisms through which different types of care influence QOL.

There are study limitations that must be mentioned. First, causal associations cannot be discussed, given the cross-sectional design of the study. Second, there are potential confounding factors that were not controlled for in the study such as social support and diabetes knowledge. In addition, information for prescribed medications used to treat diabetes among the study participants was not collected; therefore, potential differences in the relationship between PCC, glycemic control, self-care behaviors, and QOL based on appropriateness of medication intensity cannot be considered.

PCC has the potential to increase satisfaction with care, improve clinical and behavioral outcomes, and reduce the underuse and overuse of medical services in chronic diseases, including diabetes that requires a comprehensive treatment plan.³⁴ Evidence suggests that patients are gradually becoming more interested in receiving health information to serve as partners in their care and collaborators in treatment decision-making; however, this will require providers to understand patient preferences and perspectives of being involved in their personal care and to consider that patient knowledge, skills, and experiences may vary significantly.^{1035,36} In this sample of patients with type 2 diabetes, PCC was significantly associated with QOL and self-care behaviors, except exercise, after controlling for multiple covariates, but was not associated with glycemic control. These findings suggest that PCC is an important factor in diabetes self-management, but may need to expand throughout the healthcare system before changes in outcomes such as glycemic control are noted.

Acknowledgment

This study was supported by Grant K24DK093699-01 from The National Institute of Diabetes and Digestive and Kidney Disease (PI: L.E.E.).

Author Contributions

L.E.E. obtained funding for the study. R.J.W., B.L.S., and L.E.E. acquired the data. J.S.W., R.J.W., B.L.S., R.H., and L.E.E. designed the study, analyzed and interpreted the data, drafted the article, and critically revised the article for important intellectual content. All authors approved the final article.

Disclaimer

This article represents the views of the authors and not those of NIH, VHA, or HSR&D.

Author Disclosure Statement

No competing financial interests exist.

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