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Health communication, self-care, and treatment satisfaction among low-income diabetes patients in a public health setting

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Abstract

Objective—Diabetes patients with limited resources often experience suboptimal care. Less is known about the role of effective health communication (HC) in caring for low income diabetes patients.

Methods—Ten health department clinics in TN participated in a trial evaluating a literacy-sensitive communication intervention. We assessed the quality of baseline HC and measured associations with diabetes outcomes. Assessments included: demographics, measures of HC, health literacy, self-care behaviors, self-efficacy, medication non-adherence, treatment satisfaction, and A1C. Unadjusted and adjusted multivariable regression models were used to test associations.

Results—Participants (N=411) were 49.7 ± 9.5 years, 61% female, uninsured (96%), with A1C 9.6 ± 2.1. In unadjusted analyses, better communication, was associated with lower medication non-adherence (OR 0.40-0.68, all $p<0.05$), higher treatment satisfaction (OR 1.76-1.96, all $p<0.01$), portion size reduction (OR 1.43, $p<0.05$), diabetes self-efficacy (OR 1.41, $p<0.05$), and lower A1C ($\beta = -0.06$, $p<0.01$). In adjusted analyses, communication quality remained associated

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Conflicts of interest

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with lower medication non-adherence (AOR 0.39-0.68, all $p<0.05$), and higher treatment satisfaction (AOR 1.90-2.21, all $p<0.001$).

Conclusions—Better communication between low-income patients and providers was independently associated with lower medication non-adherence and higher treatment satisfaction.

Practice Implications—Communication quality may be an important modifiable approach to improving diabetes care for vulnerable populations.

Keywords

diabetes; health communication; public health; primary care; provider education

1. Introduction

Approximately 26 million people in the U.S. have been diagnosed with diabetes, placing them at increased risk for the many untoward complications of poor control [1]. Often, minority diabetes patients and those with limited resources face disproportionate challenges such as greater barriers to access, poorer health outcomes, and increased burden of disease [2]. Many of these patients seek care in public healthcare settings, where despite strong evidence about the optimal treatment of diabetes, care often remains suboptimal [2-5]. Unfortunately, national efforts to achieve benchmarks in quality of care for these groups continue to fall short [6, 7].

Ineffective health communication between patients and providers in public healthcare settings may contribute to suboptimal care. Providers in these settings often report time constraints, challenges to continuity of care with patients, and greater limitations of staffing & resources, compared to private settings [8-10]. Additionally, patient factors such as limitations in health literacy and diabetes-specific numeracy (i.e. computational) skills may potentiate existing challenges to effective health communication when attempting to provide care for vulnerable populations [11, 12]. Low health literacy and diabetes numeracy are recognized barriers to adequate diabetes care [13, 14]. We have conducted several studies among both English and Spanish-speaking diabetes patients that have identified moderate to high prevalence of limited functional health literacy and numeracy skills [15-20]. We have also shown these limitations to be significantly associated with several diabetes-related factors such as poorer self-efficacy for self-management, less diabetes knowledge, worse medication adherence, and poorer glycemic control [15, 17-25]. Although patients with limited literacy and numeracy skills may experience poorer communication with their provider [26], less is known about the specific relationship between the patient-provider interaction and diabetes related outcomes; and current evidence has been shown to be of mixed quality as supported by a recent systematic review [13].

Academic and community partnerships may be an effective model for improving communication in healthcare and addressing disparities of diabetes care for underserved populations [27, 28]. The **aims** of this article therefore seek to address two specific research questions based on assessment of baseline data from a larger clinical trial occurring within the context of an academic-community partnership: 1) What is the perception of the quality of communication during clinical encounters by diabetes patients seeking care in a public health department setting?, and 2) What is the association among patients' perception of the quality of communication and reports of self-care behaviors, treatment satisfaction, self-efficacy, and glycemic control?

2. Methods

2.1. Study Setting & Patients

In 2010 we established a partnership between an academic medical center and a regional health department in Tennessee whose state diabetes prevalence that year was high at **10.2% compared to the national average of 8.3%** [1,29]. The PRIDE Study (Partnership to Improve Diabetes Education) is a prospective, cluster randomized-controlled trial designed to address health communication issues and develop a sustainable model for improving diabetes care in our region that includes both urban and rural settings [30].

Providers, including physicians, nurse practitioners, nurses, dieticians, and medical interpreters employed within 10 State Health Department Clinics were invited to participate, and clinics were randomly assigned to one of two conditions. Providers at five intervention sites were exposed to training in effective health communication including instruction on working with low health literacy populations, strategies for improving communication during clinical encounters (e.g. teach back, goal setting, reduction of jargon, motivational interviewing), and effective use of medical interpreters. In addition to evidence-based updates in diabetes care, these providers also received education on the use of a diabetes toolkit designed specifically for use among patients with limited literacy and numeracy skills [31]. The remaining five clinics were provided evidence-based updates in diabetes care and were given educational materials from the National Diabetes Education Program to share with patients. These five clinics did not receive any training in effective health communication.

Eligible patients at participating clinics included individuals with a diagnosis of Type 2 diabetes, between the ages of 18-85, English and/or Spanish-speaking, A1C ≥ 7.5%, and agreeing to the 2-year duration of the study. Patients were excluded for poor visual acuity (>20/50 on a pocket screener), clinically significant dementia/psychosis, or if they had a life expectancy less than 2 years. Providers that participated in the intervention or control site training sessions were incentivized with state-approved continuing education credits while patients received a cash remuneration of $20 following completion of baseline data collection. The Vanderbilt University and Tennessee State Health Department IRBs provided study approval prior to enrollment.

2.2. Main Measures

Patients were approached by bilingual research staff during regular clinic hours and by phone referral from clinic staff with informed consent obtained in the patient's language of preference (English or Spanish). Baseline patient assessments included collection of demographic, anthropometric (height, weight, BMI), and clinical measures (blood pressure, A1C, lipid profile). Before the clinical encounter with a provider, each participant reported their current diabetes self-care behaviors including responses to a Personal Diabetes Questionnaire (PDQ-11) and the Adherence to Refills and Medications Scale (ARMS). The PDQ-11 is an eleven item version of an original 68-item scale [32] that assesses an individual's current and planned nutritional and exercise behaviors. The ARMS is a validated 12-item measure that evaluates an individual's level of medication non-adherence in the areas of medication taking and refill behaviors [33]. Psychometric assessment of the PDQ-11 indicated it is best to combine the first three items into a Poor Eating Behavior subscale (Cronbach's alpha = 0.66) and items 4, 5, and 6 into a Use of Data to Modify Diet subscale (Cronbach's alpha = 0.81). The remaining five items assess the frequency of meal skipping, portion control, physical activity, and stages of change for exercise & weight management and were treated as individual variables. Higher scores on the PDQ-11 indicate greater presence of the reported behavior and scores ≥ 16 on the ARMS reflect greater medication non-adherence. Health literacy was measured using the Short Test of Functional Health Literacy in Adults (s-TOFHLA) [34] and responses were dichotomized to adequate vs. less-than-adequate for scores ≥23 or ≤22 respectively. Diabetes treatment satisfaction and diabetes related self-efficacy were assessed using the Diabetes Treatment Satisfaction Questionnaire (DTSQ) and Perceived Diabetes Self-Management Scale (PDSMS) where higher scores indicate greater treatment satisfaction and self-efficacy respectively [35, 36].

Two measures of health communication were administered to each participant, one before and the other after the initial clinical encounter. The Interpersonal Processes of Care Survey (IPC-18), the "before" measure, has been validated in a multi-ethnic population and measures patients' perception of provider communication on several dimensions [37]. We report the IPC-18 using three broad domains as recommended by Stewart *et al.* – 1) Communication includes the dimensions of "lack of clarity," "elicitation of concerns," and "explanation of results;" 2) Decision Making represents the dimension "working together;" and 3) Interpersonal Style includes the dimensions "compassionate" and "discriminated due to race/ethnicity" [38]. Questions referring to office staff were excluded to isolate patients' perception of provider communication only. The Communication Assessment Tool (CAT) was administered *after* the encounter. The CAT measures perceptions of physician performance in the areas of communication and interpersonal skills and has been evaluated in a variety of care settings and among diverse patients [39].

2.3. Statistical Analysis

Patient characteristics were summarized using mean ± SD for continuous and ordinal variables, and proportions for categorical variables. Our main outcomes of interest were treatment satisfaction (DTSQ), medication non-adherence (ARMS), diabetes self-care behaviors (PDQ-11), self-efficacy (PDSMS), and glycemic control (A1C). We examined the independent association of these outcomes with each of the measured communication variables: IPC-18 domains (Communication, Decision Making, and Interpersonal Style) and CAT score. Responses for all communication variables were dichotomized to compare scores of 5 to scores < 5 so as to account for the tendency of values to cluster around positive responses (i.e. positive skew) and in congruence with previous analyses of these measures [40, 41]. Following log transformation, glycemic control (A1C) was analyzed using linear regression while all other outcomes were assessed using proportional odds logistic regression. Both unadjusted and adjusted associations were examined. To avoid overfitting, adjusted models included the following list of *a priori* defined variables: age, gender, race, ethnicity, health literacy status, education level, income, years since diagnosis, insurance (uninsured vs. some form of insurance), insulin use, and treatment assignment. Adjustment for treatment assignment was done due to the fact that providers at intervention cites had received some education on communication prior to completion of baseline data collection.

To address the issue of potential collinearity among covariates we computed a variance inflation factor (VIF) for each adjusted model. The maximum VIF value did not exceed a recommended threshold of 10 [42]. The effects of the main covariates on each outcome were reported as adjusted odds ratios (AOR) with 95% confidence intervals for ordinal outcomes and as change in log for A1C. Subjects with missing outcome or covariate values were excluded from the analyses. Findings with a 2-sided p-value < 0.05 were considered statistically significant. All statistical analyses were performed using statistical package R software version 2.15.0 (http://www.r-project.org).

3. Results

From July 2011 through August 2013, 573 patients were approached. One hundred and sixty-two patients either declined participation or were deemed ineligible; 411 patients were consented and enrolled. Three participants were excluded from this analysis as we focused on those individuals who self-identified as Non-Hispanic White, Non-Hispanic Black, or Hispanic/Latino, resulting in a final sample size of 408 participants (Figure 1). We observed that on average, participants were middle aged, predominantly female, had low annual income, and modest educational attainment. Nearly all participants were uninsured. The majority of participants were White but there was 37% minority representation (i.e. Black and/or Hispanic) in the sample. According to the s-TOFHLA, functional health literacy level was adequate in 83% of the sample. Assessment of diabetes-related characteristics revealed overall poor glycemic control, and over half of the sample was on insulin (nationally 17% of patients with diabetes were on insulin only in 2010) [1]. Most participants were overweight or obese.

In unadjusted analyses (Table 2), higher communication, decision making, interpersonal style (i.e. IPC domains), and CAT scores were associated with near twice the odds of greater diabetes treatment satisfaction and near half the odds of higher medication non-adherence. Similarly, higher decision making scores were marginally associated with a 43% increase in the odds of greater portion size reduction and a 41% increase in the odds of greater self-efficacy for self-management. Higher interpersonal style score was also significantly associated with better glycemic control (A1C). No significant associations were observed for the other diabetes self-care variables as measured by the PDQ-11.

In adjusted analyses that controlled for age, race/ethnicity, gender, education, insurance, income, years since diagnosis, treatment assignment, literacy level, and insulin status, several important associations remained significant. Higher communication, decision making, interpersonal style, and CAT scores remained significantly associated with twice the odds of reporting greater diabetes treatment satisfaction and near half the odds of greater medication non-adherence. Higher interpersonal style score was significantly associated with lower odds of using data to modify one's diet. Finally, the previously observed associations between decision making score and portion size reduction, decision making score and self-efficacy for diabetes care, and interpersonal style score and glycemic control were reduced to non-significance [Table 2].

4. Discussion and Conclusion

4.1. Discussion

In this sample of predominantly uninsured, low-income, diabetes patients, we observed significant associations between patient's perceptions of the quality of provider communication and several diabetes-related outcomes. Communication quality in this study was reflective of the provider's ability to communicate clearly, effectively elicit patient concerns, explain results of laboratory and exam findings, involve the patient in decision making, spend adequate time with the patient, and demonstrate compassion & concern. Our study demonstrated that greater performance in these areas was significantly associated with higher diabetes treatment satisfaction and less medication non-adherence.

Treatment satisfaction and medication adherence clearly are important components of high value-based care for patients with chronic diseases, like diabetes. Lower satisfaction with treatment has been shown to be associated with diabetes complications and lower adherence to both medication and follow-up recommendations [43]. The reasons for medication non-adherence among diabetes patients are certainly multifactorial and often complex. Our findings lend support to those studies that have identified a positive association between provider communication quality and both objective and subjective reports of medication adherence. For example, among diabetes patients in a managed care setting, Ratanawongsa *et al.* found that when providers were rated lower in their ability to involve patients in decisions, understand their patients' problems with treatment, and elicit confidence and trust, patients objectively were noted to have poorer medication refill adherence [44]. Similarly, Piette *et al.* reported that both general and diabetes-specific communication was positively associated with self-reported foot care, medication adherence, and diet and exercise behaviors among a diverse sample of patients primarily seen in a VA health care system [45].

To our knowledge, our study is among the first to identify similar associations between communication quality and diabetes outcomes among a predominantly low income, uninsured population seeking care in a public health setting, and provides insight into potential mechanisms for addressing disparities for vulnerable patients within these systems of care. It is important to note that racial/ethnic minorities in comparable practice settings have been shown to desire improved communication and support from their providers at similar rates compared to Whites [46, 47], yet providers are not always successful in meeting expectations for culturally competent care in general [48-50] and/or have been shown to potentially contribute directly to disparities of effective health communication [51]. These findings suggest that there remains a need for improvements in the patient-provider interaction during public health encounters for diabetes patients. This in fact is a major goal of our larger clinical trial that focuses on improving providers' delivery of diabetes care in these settings [30].

Our analysis is subject to several limitations. Due to the cross-sectional design of the current set of analyses, we are unable to make inferences regarding causation among our observed associations. Also, despite successful recruitment of a diverse sample within a large public health system, we are cautious about generalizing our findings to other public health settings with different demographics. Our analyses were exploratory and no correction for multiple comparisons was performed. Further studies are needed to address each specific hypothesis of association, and to confirm reproducibility of our findings. Additionally, our sample size may have precluded the identification of associations between communication quality and other important diabetes factors such as diet/exercise behaviors and glycemic control. Finally, our study focuses on patient self-report of communication quality and self-care behaviors and is subject to social desirability biases.

4.2. Conclusion

Future evaluation of our program will provide additional knowledge and insight into the effects of improved provider communication on diabetes related outcomes. Overall, we have provided initial evidence that communication quality may be related to patient's medication behaviors and overall satisfaction with care, supporting the role of effective health communication as a potentially key component of quality care for low income patients with diabetes.

4.3. Practice Implications

Safety-net, health department clinics often experience challenges of staffing and resources yet provide important access to care for low-income, underserved populations. Effective health communication in these settings may be an important component of high quality care for vulnerable populations. Targeted efforts such as ours to address disparities in diabetes care through improvements in the patient-provider interaction should be encouraged and supported.

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Highlights

- Poor health communication (HC) may influence diabetes care for patients with limited resources
- We examined the association of HC with select diabetes factors for patients in a safety-net system in TN
- Predictors included self-reports of provider communication using validated measures
- Better communication was associated with lower medication non-adherence and higher treatment satisfaction
- Communication quality may be an important modifiable strategy for improving diabetes care for vulnerable populations

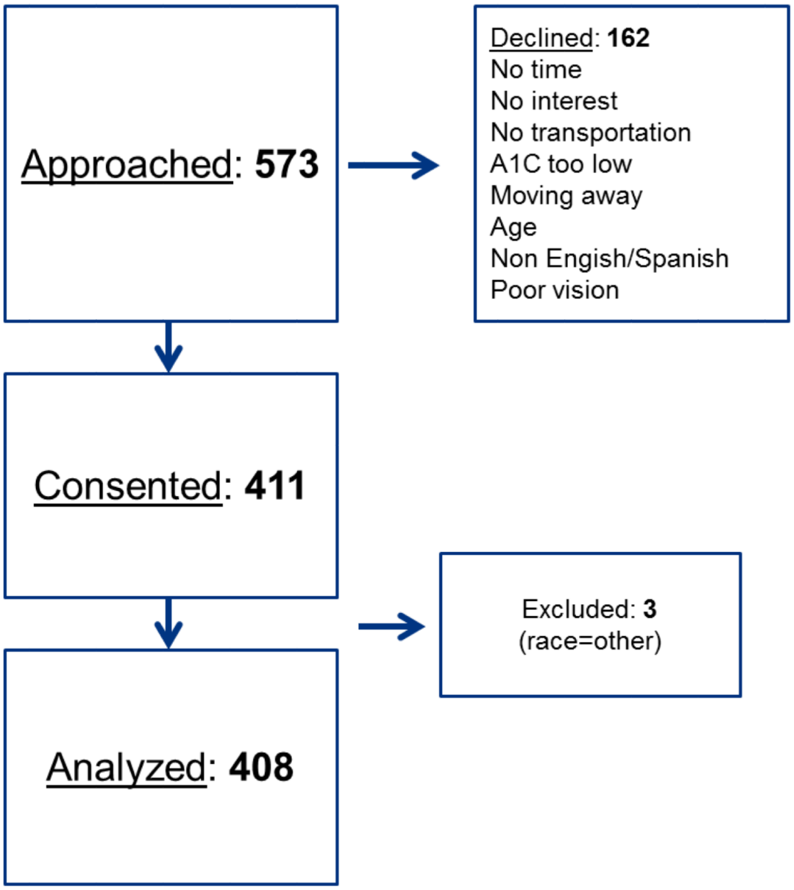

Figure 1. Study Flow

Table 1

Patient Characteristics and diabetes-related factors

Variable	**Mean ± SD or n (%)**
N=408	
Demographics	
Age	49.7 ± 9.5
Gender	
Male	160 (39%)
Female	248 (61%)
Race	
White	257 (63%)
Black	72 (18%)
Other	79 (19%)
Hispanic	
Yes	97 (24%)
No	311 (76%)
Education	
Less than HS	149 (37%)
HS grad/equivalent	142 (35%)
Some college or beyond	115 (28%)
Health Literacy (s-TOFHLA)	
Adequate	331 (83%)
Inadequate + Marginal (Limited)	68 (17%)
Household Income	
<$10,000	218 (54%)
$10,000-19,999	115 (28%)
>$20,000	71 (18%)

Variable	Mean ± SD or n (%)
Insurance Status	
Uninsured	388 (96%)
Insured	17 (4%)
Diabetes Characteristics	
A1C	9.6 ± 2.1
Insulin use	
Yes	242 (59%)
Time since diagnosis, years	9.0 ± 7.1
BMI (kg/m^2)	35.7 ± 8.9
LDL (mg/dl)	102 ± 43
Blood Pressure	
Systolic	133 ± 20
Diastolic	80 ± 10
Measures of Patient-Provider Interaction & Self-Care	
IPC-18 (1-5)	
Communication	
Less than 5	264 (65%)
5	144 (35%)
Decision Making	
Less than 5	231 (57%)
5	177 (43%)
Interpersonal Style	
Less than 5	167 (41%)
5	241 (59%)
CAT Mean Score (1-5)	
Less than 5	210 (51%)

Variable	Mean ± SD or n (%)
5	198 (49%)
Treatment Satisfaction (DTSQ) (0-36)	28.1 ± 6.6
Medication Non-Adherence (ARMS) (12-48)	17.2 ± 4.2
Self-efficacy (PDSMS) (8-40)	16.6 ± 5.8
PDQ-11	
Poor eating behavior (3-18)	10.0 ± 3.4
Use of data to modify diet (3-18)	8.2 ± 4.7
Skipped meals (%)	
Never	196 (48%)
One or more times/month	209 (52%)
Portion control (%)	
Never	133 (33%)
One or more times/month	271 (67%)
Physical activity (%)	
Very inactive-a little active	174 (43%)
Moderate-very active	231 (57%)
Weight management, stage of change	
No plan-starting next month	217 (53%)
Started within 6 months-active ≥ 6 months	187 (47%)
Exercise, stage of change	
No plan-starting next month	237 (59%)
Started within 6 months-active ≥ 6 months	167 (41%)

Table 2

Unadjusted & Adjusted Regression Modeling of Main Effects

Dependent Diabetes-related Outcome	Independent Communication Variables							
	Communication Score (IPC)		Decision Making Score (IPC)		Interpersonal Style Score (IPC)		Communication Assessment Test Score (CAT)	
	^{a}Unadjusted OR (CI)	^{a}Adjusted OR (CI)	^{a}Unadjusted OR (CI)	^{a}Adjusted OR (CI)	^{a}Unadjusted OR (CI)	^{a}Adjusted OR (CI)	^{a}Unadjusted OR (CI)	^{a}Adjusted OR (CI)
Treatment Satisfaction (DTSQ) n=385	1.76 (1.24, 2.51)†	2.02 (1.38, 2.95)‡	1.96 (1.39, 2.76)‡	1.90 (1.31, 2.74)‡	1.92 (1.36, 2.74)‡	2.02 (1.39, 2.92)‡	1.8 (1.28, 2.54)‡	2.21 (1.53, 3.19)‡
Medication Non-adherence (ARMS) n=385	0.41 (0.29, 0.59)‡	0.45 (0.3, 0.66)‡	0.40 (0.28, 0.57)‡	0.39 (0.27, 0.57)‡	0.60 (0.42, 0.85)†	0.66 (0.46, 0.95)*	0.68 (0.48, 0.96)*	0.68 (0.48, 0.98)*
PDQ-11 Use of data to modify diet; n=385	0.92 (0.64, 1.31)	0.81 (0.55, 1.20)	0.92 (0.65, 1.3)	0.78 (0.54, 1.13)	0.73 (0.52, 1.04)	0.64 (0.44, 0.92)*	0.73 (0.52, 1.04)	0.96 (0.67, 1.38)
Reduced portion size n=394	0.93 (0.65, 1.34)	0.85 (0.58, 1.25)	1.43 (1.01, 2.04)*	1.23 (0.84, 1.79)	1.04 (0.73, 1.48)	0.94 (0.65, 1.36)	0.95 (0.67, 1.35)	0.79 (0.55, 1.15)
Diabetes Self-efficacy (PDSMS) n=385	1.20 (0.84, 1.71)	1.07 (0.73, 1.56)	1.41 (1.0, 1.99)*	1.41 (0.98, 2.03)	1.01 (0.72, 1.43)	0.99 (0.69, 1.42)	1.21 (0.86, 1.69)	1.05 (0.73, 1.5)
	^{b}Unadjusted β (CI)	^{b}Adjusted β (CI)	^{b}Unadjusted β (CI)	^{b}Adjusted β (CI)	^{b}Unadjusted β (CI)	^{b}Adjusted β (CI)	^{b}Unadjusted β (CI)	^{b}Adjusted β (CI)
Glycemic Control (A1C) n=379	−0.02 (−0.06, 0.03)	0.01 (−0.03, 0.05)	−0.01 (−0.05, 0.03)	0.00 (−0.04, 0.04)	−0.06 (−0.10, − 0.02)†	−0.04 (−0.08, 0.0)	−0.01 (−0.05, 0.03)	0.01 (−0.03, 0.05)

Each model controlled age, race/ethnicity, gender, education, insurance, income, years since diagnosis, treatment assignment, literacy level, and insulin status

[a] proportional odds logistic regression

[b] linear regression of log transformed A1C.

[*] $p<0.05$

[†] $p<0.01$

[‡] $p<0.001$