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Functional health literacy and the quality of physician–patient communication among diabetes patients

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Abstract

While patients with poor functional health literacy (FHL) have difficulties reading and comprehending written medical instructions, it is not known whether these patients also experience problems with other modes of communication, such as face-to-face encounters with primary care physicians. We enrolled 408 English- and Spanish-speaking diabetes patients to examine whether patients with inadequate FHL report worse communication than patients with adequate FHL. We assessed patients' experiences of communication using sub-scales from the Interpersonal Processes of Care in Diverse Populations instrument. In multivariate models, patients with inadequate FHL, compared to patients with adequate FHL, were more likely to report worse communication in the domains of general clarity (adjusted odds ratio [AOR] 6.29, $P < 0.01$), explanation of condition (AOR 4.85, $P = 0.03$), and explanation of processes of care (AOR 2.70, $P = 0.03$). Poor FHL appears to be a marker for oral communication problems, particularly in the technical, explanatory domains of clinician–patient dialogue. Research is needed to identify strategies to improve communication for this group of patients.

Keywords: Functional health literacy; Physician–patient communication; Adjusted odds ratio

1. Introduction

There is a growing recognition that interpersonal processes of care, in addition to technical processes of care, contribute to the overall quality of health care [1–5]. Interpersonal processes encompass the social–psychological aspects of the clinical interaction, including patient–provider communication. The quality of interpersonal care processes is associated with patients' self-care behavior and health outcomes for a number of conditions, including diabetes [6–12]. Some hypothesize that poor interpersonal care processes contribute to disparities in health between disadvantaged and non-disadvantaged populations [5].

Poor functional health literacy (FHL) is common among patients who have low educational attainment, and among older patients and racial and ethnic minorities [13]. As many as one in three Medicare patients has poor FHL; in public sector settings, poor FHL is the rule rather than the exception [14,15]. FHL is a measure of a patient's ability to perform basic reading and numerical tasks required to function in the health care environment [13] and is distinct from education level and language ability. Poor FHL is independently associated with poor self-rated health [16], poor understanding of one's condition and its management [17–19], and higher utilization of services [20,21]. Recently, FHL has been shown to be independently associated with glycemic control and diabetes complications among a cohort of public hospital patients [22]. Although the mechanisms whereby poor FHL impacts health outcomes are not clear, it is likely that ineffective information flow in the health care context plays a role [23].

One natural strategy for circumventing the barriers to written communication associated with poor FHL would be to augment or substitute oral for written clinical communication. However, patients with poor FHL may not only have limitations in reading and numeracy, but also may have difficulties processing oral communication [5,24–26]. In the health care context, analysis of focus groups and individual interviews with patients with low literacy revealed pervasive communication problems with health care providers,

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including problems during face-to-face encounters [27]. For example, patients frequently told of being informed about their medical problems and treatments in ways they could not understand.

We undertook a study of ethnically diverse primary care patients with type 2 diabetes to examine the relationship between FHL and the quality of clinician–patient communication. We selected diabetes because the nature of the disease and its treatment requires intensive, ongoing patient–provider communication around such disparate domains as the elicitation of symptoms, explanations of the condition, self-care, diagnostic testing, and decision-making. Moreover, the quality of patient–physician communication has been shown to be associated with self-care behaviors and clinical outcomes among patients with diabetes [6,10].

2. Methods

2.1. Setting and study participants

We performed this study within the context of a larger study examining the relationship between FHL and diabetes outcomes [22]. The protocol was approved by the Human Subjects Committee of University of California San Francisco (UCSF).

Patients were enrolled in two primary care clinics (a family practice and a general internal medicine clinic) at San Francisco General Hospital (SFGH), the public hospital for the City and County of San Francisco. The clinics serve patient populations that are ethnically diverse and of low socioeconomic status. Patients in these clinics receive ongoing care by University of California San Francisco attending faculty and residents. Over 90% of type 2 diabetes patients at SFGH are cared for by primary care physicians. For non-English speaking patients, professional interpreter services are generally available.

Between June 2000 and December 2000, bilingual research assistants attempted to enroll all eligible patients who attended a clinic appointment. Written and/or oral consent to participate was obtained from patients prior to their enrollment. Patients were offered US$ 5.00 for their participation.

Potential participants were identified by querying the hospital system's computerized clinical and administrative database. Patients were eligible if they were over age 30 years, had type 2 diabetes (ICD-9 codes of 250._0 or 250._2), and spoke English or Spanish fluently. Participants had to have a primary care physician in one of the clinics for at least 6 months and to have made at least one visit to this physician within the prior 6 months. We excluded patients with any documented billing diagnosis of end-stage renal disease, psychotic disorder, dementia, or blindness (conditions which may interfere with accurate FHL measurement). To ensure that our list of patients reflected eligibility criteria as accurately as possible, we also provided primary care physicians ($n = 89$) with a list of their eligible patients generated from the database and asked them to indicate patients meeting criteria for exclusion. Because FHL assessment can be biased by uncorrected visual impairements, patients who agreed to participate first had their visual acuity tested using a pocket vision screener (Rosenbaum, Granham-Field Surgical Co. Inc.). Patients with corrected vision 20/50 or worse were excluded.

2.2. Measures

Trained bilingual research assistants interviewed patients in clinic prior to their appointment. To measure functional health literacy, we used an abbreviated version of the short-form Test of Functional Health Literacy in Adults (s-TOFHLA, 14-point font), English and Spanish versions. This s-TOFHLA has been shown to be a reliable and valid measure of health-related literacy [22,28–30]. The abbreviated s-TOFHLA is a 36-item timed reading comprehension test that uses the modified Cloze procedure [31]; every fifth to seventh word in a passage is omitted, and four multiple-choice options are provided. It contains two health care passages, the first selected from instructions for preparation for an upper gastrointestinal tract radiograph series (Gunning-Fog Index [32] readability grade 4.3) and the second from the patient's "Rights and Responsibilities" section of a Medicaid application (Gunning-Fog Index readability grade 10.4). The abbreviated s-TOFHLA is scored on a scale of 0–36. Using established convention, we categorized patients as having *inadequate* FHL if the s-TOFHLA score was 0–16, *marginal* FHL if it was 17–22, and *adequate* FHL if it was 23–36. Patients with inadequate FHL often misread simple materials, such as prescription bottles, appointment slips, or nutrition labels; patients with marginal FHL frequently have trouble with more complex materials, such as an educational brochure or a patient rights and responsibilities document [15].

We measured the quality of physician–patient communication using the communication sub-scales of the Interpersonal Processes of Care in Diverse Populations Questionnaire (IPC) [4]. The IPC was developed to validate a hypothesized conceptual framework of the domains of interpersonal processes of care relevant to ethnically diverse patients of low socioeconomic status [4] and has been validated [33]. The IPC, in its entirety, is a 40-item questionnaire that asks patients to report their experience with their provider ("your doctor") in the prior 6 months across two dimensions: communication and interpersonal style. Because we were interested in the relationship between FHL and patient–physician communication, we focused in the current study on the 20 communication items, which are grouped into the seven sub-scales of (1) general clarity, (2) elicitation of and responsiveness to patient problems, concerns and expectations, (3) explanations of condition, progress, and prognosis, (4) explanations of processes of care, (5) explanations

Table 1
Selected interpersonal processes of care (IPC) scales and associated items

No.	Scale	Item[a] (over the past 6 months)
I	General clarity	How often did your regular doctor use medical words that you did not understand? How often did you have trouble understanding your doctor because he/she spoke too fast?
II	Elicitation of and responsiveness to patient problems, concerns and expectations	How often did your doctor give you enough time to say what you thought was important? How often did your doctor listen carefully to what you had to say?
III	Explanations of condition	How often did your doctor give you enough information about your health problems? How often did your doctor make sure you understood your health problems?
IV	Explanations of processes of care	How often did your doctor explain why a test was being done? How often did your doctor explain how the test is done? How often did you feel confused about what was going on with your medical care because your doctor did not explain things well?
V	Explanations of self-care	How often did your doctor tell you what you could do to take care of yourself at home? How often did your doctor tell you how to pay attention to your symptoms and when to call him/her? How often did your doctor explain clearly to you how to take the medicine (i.e. when, how much, and for how long)? How often did your doctor go over all of the medicines you were taking? How often did your doctor give you written instructions about how to take the medicine (other than what was on the container)? How often did your doctor tell you the reason for taking the medicine? How often did your doctor tell you about side-effects you might get from your medicine?
VI	Empowerment	How often did your doctor make you feel that following your treatment (care) plan would make a difference in your health? How often did your doctor make you feel that your everyday activities such as your diet and lifestyle would make a difference in your health?
VII	Decision-making around desire and ability to comply	How often did your doctor ask if you might have any problems actually doing the recommended treatment? How often did your doctor understand the kinds of problems you might have in doing the recommended treatment?

[a] Response categories (1–5 Likert scale): always, often, sometimes, rarely, never.

of self-care, (6) empowerment, and (7) decision-making. The internal consistency reliabilities of the seven sub-scales have all been shown to be high [4].

Patients respond to IPC items by reporting the frequency of specific behaviors using a five-point Likert scale ranging from "always" to "never." For example, in the general clarity scale, patients are asked "over the last 6 months, how often did your doctor use words that you did not understand?" For Spanish-speakers, we used the Spanish IPC instrument, a version that had been previously translated into Spanish and back-translated into English [4]. We have included the specific IPC items in Table 1. The Flesch-Kincaid readability [34] of the IPC instrument is grade 7.5. Research assistants read all IPC items to study patients.

The in-person patient questionnaire also included items regarding subjects' demographic characteristics (age, race/ethnicity, language status, education, insurance status), current diabetes medication use (use of diet, oral hypoglycemic agents, insulin), depressive symptoms, diabetes duration, length of time in the care of their primary care physician, and (for Spanish-speakers) whether the physician spoke Spanish. We measured depressive symptoms using the validated Center for Epidemiologic Studies Depression Scale-10 (CESD-10), which has been used in previous diabetes research [35,36].

Finally, we measured the extent of patients' diabetes control by querying the hospital system's computerized clinical database for each patient's most recent hemoglobin A1c (HbA1c) value.

2.3. Statistical analysis

For each patient, we generated IPC sub-scale scores by adding up individual item scores within a scale and dividing the total score by the number of items. As is the case in most studies in which patients rate their communication with their physician, patients' responses were skewed toward positive experiences. As a result, we generated a dichotomous outcome variable of poor IPC versus good IPC based on the mean scores for each sub-scale. After rounding mean sub-scale scores to the nearest integer, mean sub-scale scores of 4–5 on the Likert scale (corresponding to *never*/*rarely* for positive attributes, or *always*/*often*/*sometimes* for negative attributes) were categorized as poor IPC, and mean sub-scale scores of 1–3 on the Likert scale (corresponding to *always*/*often*/*sometimes* for

positive attributes, and *never*/*rarely* for negative attributes) were categorized as good IPC.

We then analyzed the extent to which FHL was associated with the quality of communication within each of the domains measured by the IPC sub-scales. In bivariate analysis, for each IPC sub-scale, we compared the percentage of patients with inadequate FHL and marginal FHL who reported poor IPC to the percentage of patients with adequate FHL, and generated odds ratios comparing poor IPC among patients with inadequate to adequate FHL, and marginal to adequate FHL. To isolate the independent effect of FHL on IPC sub-scales, we used logistic regression analysis to measure the association between FHL and sub-IPC scales, controlling for other potentially confounding patient characteristics. We included covariates that we hypothesized to influence IPC as well as others that had borderline statistically significant associations ($P < 0.15$) in bivariate analyses with at least two of the seven IPC sub-scales. Specifically, we performed logistic regression, controlling for patients' age, race/ethnicity, sex, education, language, insurance, treatment regimen, HbA1c, depression (CESD-10) score, diabetes duration, patient reports of physician's Spanish fluency, and length of time in the physician's care. Standard errors for all model coefficients were adjusted for the clustering of patients within physician, using Generalized Estimating Equations [37]. Because of the potential interaction between a patient's language (English or Spanish) and FHL level on the quality of interpersonal communication, we formally tested for this interaction.

To address the concern that the internal consistency reliability of the IPC instrument may vary with FHL, we first measured internal consistency reliability for each IPC sub-scale for the entire sample and repeated this analysis across FHL categories. Cronbach alpha scores were all in the acceptable range (a low of 0.53 to a high of 0.84) and found no meaningful FHL-related differences in internal consistency reliability across FHL categories.

3. Results

Eight hundred and fifty-eight diabetes patients were identified by the San Francisco General Hospital clinical database as potentially eligible for the study. Of these, 142 were ineligible because their primary care physicians informed us that the patients were not in their panel ($n = 10$), did not have type 2 diabetes ($n = 25$), did not speak English or Spanish fluently ($n = 28$), had moved out of the area ($n = 35$), had a psychiatric condition, e.g. dementia, psychosis, or mental retardation ($n = 23$), or had died ($n = 1$). An additional 20 patients were identified as ineligible by physicians who provided no reason. Of the 716 remaining patients, 261 did not make a primary care visit during the enrollment period. All remaining 455 patients were approached during a clinic appointment. Of these, 36 patients refused to participate, 9 were excluded because they were too ill to participate, 2 were acutely intoxicated, and 6 had poor visual acuity (≥20/50). Four hundred and thirteen patients consented to the study and were enrolled. Four hundred and eight of the 413 patients completed the entire questionnaire and had a HbA1c on record; these patients composed our study sample. The 408 patients were cared for by 88 physicians. Patients who refused to participate and patients who were not interviewed by virtue of not attending a clinic appointment during the enrollment period were more likely than study subjects to be younger and male but were not different in terms of race/ethnicity and language.

Study subjects were ethnically diverse, had low educational attainment, and were predominantly uninsured or publicly insured (Table 2). Most patients were treated with oral hypoglycemic agents, either alone or in combination with insulin. The mean abbreviated s-TOFHLA score was 21 (range 0–36). Thirty-eight percent of patients had inadequate FHL (s-TOFHLA score 0–16), and 13% had marginal FHL (s-TOFHLA score 17–22). Patients with inadequate FHL were more likely than patients with adequate FHL (s-TOFHLA 23–36) to be older, female, non-white, Spanish-speaking, have Medicare coverage, and to have received only some high school education or less. Among Spanish-speakers ($n = 148$), 140 (95%) reported that they spoke no or only little English, and 37 (25%) reported that their physician did not speak Spanish.

Overall, patients provided favorable reports of their experience with their physician, with reports of poor IPC ranging from 6 to 36% across IPC sub-scales (Table 3). With the exception of one IPC sub-scale, patients with inadequate and marginal FHL reported the quality of interpersonal processes of care to be lower than that reported by patients with adequate FHL. The quality of interpersonal processes of care for patients with marginal FHL tended to be of intermediate quality between that of inadequate and adequate FHL or similar to that of patients with inadequate FHL. For example, in the explanation of processes of care scale, 21% of patients with inadequate FHL reported poor IPC, as compared to 19% of patients with marginal FHL, and 10% of patients with adequate FHL. In the empowerment scale, 21% of patients with inadequate FHL reported poor IPC, as compared to 22% of patients with marginal FHL, and 12% of patients with adequate FHL.

In bivariate analyses, inadequate FHL was associated with poorer quality of interpersonal processes across five of the seven IPC sub-scales (Table 4), including general clarity (OR 4.54, $P < 0.01$), explanation of condition (OR 3.02, $P = 0.04$), explanation of processes of care (OR 2.25, $P < 0.001$), empowerment (OR 2.05, $P = 0.02$), and decision-making (OR 2.30, $P < 0.001$). In contrast, compared to patients with adequate FHL, patients with inadequate or marginal FHL did not report worse interpersonal processes of care on either the elicitation of patient problems sub-scale (OR 1.55, $P = 0.26$) or the explanation of self-care sub-scale (OR 0.85, $P = 0.54$).

Table 2
Characteristics of patients, overall, and stratified by functional health literacy level

Characteristic	No. (%)				
	Total ($n = 408$)	Functional health literacy level[a]			
		Inadequate ($n = 156$)	Marginal ($n = 54$)	Adequate ($n = 198$)	P-value[b]
Mean age (years)	58.1	62.7	59.8	54.0	<0.001
Sex					0.01
Female	235 (58)	104 (67)	30 (56)	101 (51)	
Male	173 (42)	52 (33)	24 (44)	97 (49)	
Race/ethnicity					<0.001
Asian	75 (18)	30 (19)	10 (19)	35 (18)	
Black	100 (25)	27 (17)	13 (24)	60 (30)	
Latino	173 (42)	90 (58)	24 (44)	59 (30)	
White	60 (15)	9 (6)	7 (13)	44 (22)	
Education					<0.001
Some high school or less	185 (46)	118 (75)	23 (43)	44 (22)	
High school graduate or GED	95 (23)	26 (17)	17 (31)	52 (26)	
College graduate/some college	115 (28)	11 (7)	11 (20)	93 (47)	
Graduate degree	13 (3)	1 (1)	3 (6)	9 (5)	
Insurance status					0.004
Uninsured	130 (32)	37 (24)	18 (33)	75 (38)	
Medicare	149 (36)	75 (48)	21 (39)	53 (27)	
Medicaid	93 (23)	33 (21)	12 (22)	48 (24)	
Commercial	36 (9)	11 (7)	3 (6)	22 (11)	
Language					<0.001
Spanish	148 (36)	84 (54)	21 (39)	43 (22)	
English	260 (64)	72 (46)	33 (61)	155 (78)	
Years with diabetes (mean)	9.5	11.4	10.4	7.7	<0.001
HbA1c	8.8	8.5	9.0	8.9	0.07
Treatment regimen					0.10
Diet alone	23 (6)	10 (8)	1 (2)	12 (5)	
Oral hypoglycemic alone	223 (54)	76 (49)	33 (61)	114 (57)	
Insulin alone	49 (12)	16 (10)	4 (7)	29 (15)	
Insulin + oral hypoglycemic	113 (28)	52 (33)	16 (30)	45 (23)	
Mean depression score (0–100 scale)	38.5	37.1	39	39.5	0.58
Length of time in physician's care					0.30
<1 year	106 (26)	36 (23)	18 (33)	52 (27)	
1–3 years	193 (48)	82 (53)	19 (35)	92 (46)	
>3 years	107 (26)	38 (24)	17 (32)	52 (27)	

[a] s-TOFHLA scores 0–16 = inadequate HL; 17–22 = marginal HL; 23–36 = adequate HL.
[b] We used Chi-square test for categorical variables and analysis of variance (ANOVA) and Krustal–Wallis test for means and medians of continuous variables, respectively.

Table 3
Percent of patients reporting poor interpersonal processes of care (IPC), for total sample and stratified by functional health literacy (FHL)

Sub-scale	No. of items	% with poor IPC			
		Total sample ($n = 408$)	Inadequate FHL ($n = 156$)	Marginal FHL ($n = 54$)	Adequate FHL ($n = 198$)
General clarity	2	8	14	9	4
Elicitation of patient problems	2	7	8	11	5
Explanation of condition	2	6	9	7	3
Explanation of process of care	3	15	21	19	10
Explanation of self-care	7	18	16	20	18
Empowerment	2	17	21	22	12
Decision-making	2	36	45	46	26

Table 4
Odds of poor interpersonal processes of care (IPC), for patients with inadequate and marginal vs. adequate functional health literacy (FHL)

Sub-scale	Unadjusted				Adjusted[a]			
	Inadequate FHL		Marginal FHL		Inadequate FHL		Marginal FHL	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
General clarity	4.54 (1.76–11.73)	<0.01	2.73 (0.81–9.19)	0.11	6.29 (1.71–23.07)	<0.01	3.68 (0.95–14.23)	0.06
Elicitation of patient problems	1.55 (0.72–3.35)	0.26	2.36 (0.98–5.73)	0.06	1.86 (0.54–6.36)	0.33	2.39 (0.77–7.39)	0.13
Explanation of condition	3.02 (1.04–8.76)	0.04	2.48 (0.65–9.49)	0.18	4.85 (1.2–19.58)	0.03	3.48 (0.56–21.46)	0.18
Explanation of process of care	2.25 (1.41–3.59)	<0.001	2.01 (0.95–4.23)	0.07	2.7 (1.1–6.66)	0.03	2.39 (0.91–6.29)	0.08
Explanation of self-care	0.85 (0.5–1.43)	0.54	1.18 (0.58–2.4)	0.65	0.86 (0.39–1.89)	0.70	1.17 (0.5–2.7)	0.72
Empowerment	2.05 (1.14–3.67)	0.02	2.16 (0.97–4.83)	0.06	1.08 (0.38–3.06)	0.88	1.4 (0.53–3.71)	0.50
Decision-making	2.30 (1.5–3.51)	<0.001	2.29 (1.21–4.35)	0.01	1.66 (0.77–3.59)	0.20	2.19 (0.99–4.84)	0.05

[a] Adjusted for age, sex, race, education, insurance, patient language, HbA1c, treatment regimen, depression score, years with diabetes, length of time in physician's care, patient report of physicians' Spanish ability, and accounting.

After adjusting for age, race/ethnicity, sex, education, patient's language, insurance, treatment regimen, HbA1c, depression score, diabetes duration, physician's Spanish fluency, and length of time in the care of the physician, inadequate FHL remained independently associated with lower quality of interpersonal processes of care across three of the seven IPC sub-scales (general clarity, explanation of condition, and explanations of processes of care, see Table 4). For the empowerment and decision-making scales, patients' education level and language were the covariates primarily responsible for reducing the effect of FHL on IPC in multivariate models.

To examine whether our findings were influenced by unmeasured language discordance between Spanish-speaking patients and their physicians, we performed stratified analyses comparing the association of FHL and IPC scales separately among Spanish- and English-speaking patients. We found no statistically significant interaction between FHL and language on IPC for any of the seven sub-scales.

4. Discussion

To our knowledge, this is the first study to demonstrate an association between FHL and the quality of interpersonal processes of care, i.e. office based, primarily *oral* patient–physician communication. While patients' reports of the quality of communication were, in general, quite high, we observed robust bivariate and multivariate relationships between inadequate FHL and reports of worse communication across selected domains involving both the explanatory and participatory components of a physician's interpersonal communication (e.g. physician not explaining clearly, as well as not eliciting patient's understanding of explanation). Patients with inadequate FHL reported worse communication across domains critical to successful chronic disease care and self-management, including a physician's explanations of their condition; explanations of processes of care; empowerment; and consideration of patient's desire and/or ability to adhere to treatment plans. We observed important exceptions to this pattern for certain scales such as elicitation of patient concerns, with patients with inadequate FHL reporting quality of communication similar to that of patients with adequate FHL. This suggests that poor FHL affects the explanatory/participatory dimensions of patient–physician communication but not the "listening" dimensions.

In the explanatory domains of physician communication, it appears that patients with poor FHL are more likely to be confused or underinformed about their condition and the processes of care required to successfully manage it. While part of this may be because physicians are simply not informing patients, we believe that much of this problem is a result of physicians attempting to explain, but being either partially effective or ineffective. It is possible that physicians, unaware of the informational and communication needs of their patients [38], communicated consistently across FHL levels. This untailored communication may be less effective for patients with inadequate FHL. Patients with low literacy levels are more likely to have a restricted vocabulary, making physician's use of medical or technical terms, for example, particularly problematic. It has been suggested that the relative paucity of vocabulary and restricted knowledge base among individuals with low literacy leads to difficulties integrating oral communication, particularly when this communication involves areas in which these individuals lack familiarity or expertise [39]. Sticht et al. suggests that listening and reading are structurally similar with regard to the knowledge base that they draw upon [40]. As such, communication is influenced by an interplay among cognitive, linguistic, and reading domains [41] and the success of communication may, in part, have to do with the extent to which there is discordance between involved parties across these domains. That we found FHL-related differences in communication within the domains of general clarity, explanations of condition, and explanations of process of care suggests that patients with poor FHL are more likely to have trouble with clinical language, both due to its technicality and to the speed with which it is transmitted. Of note, we found

no FHL-related differences in the quality of communication in the explanation of self-care domain, which tends to focus on explaining health behaviors related to caring for oneself, and often involves less technical language.

Some of the FHL-associated variation in the quality of communication that we observed could also reflect the power inequities intrinsic to the physician–patient relationship. Much has been written about the relational dynamics that exist between physicians and patients of lower socioeconomic status and racial and ethnic minorities and, in specific the importance of class-based sociolinguistic barriers to communication [5,42–44]. While individuals of different social class, race, and educational backgrounds usually do not differ in their desire for information, there likely are differences with regard to the predisposition to seek and to offer information through oral channels [45,46]. Minority patients and patients with less than high school education rate visits with physicians as less participatory [47,48]. Focus groups among patients with low literacy have demonstrated that shame influences patients' health care experiences and influences behavior in the clinical encounter [27]. These patients voiced concerns around being inadequately informed about their conditions and treatments, yet admitted to only infrequently asking questions of their providers. Given the reciprocal nature of medical interactions, one can infer that patients with inadequate FHL may be more likely to employ a passive communication style, less likely to challenge the physician with a question or request for clarification and, perhaps as a result of reinforcing physician attitudes and perceptions [44], less likely to experience interactive visits.

Our study has a number of limitations. First, our main outcomes were patients' reports of their physician's interpersonal processes of care and not direct observations. While the IPC instrument, by virtue of asking patients to report on what *actually* occurred in prior visits, represents an improvement over the more traditional means of measurement (e.g. ratings of satisfaction with physician), it still is subject to recall bias. Second, while we measured important confounders that we hypothesized would impact IPC, it is possible that our findings are a result of residual confounding. Cooper and Roter, in their review of the effects of race and ethnicity on patient–provider communication [5], note the potential importance of physician–patient racial and ethnic concordance and patient's health status. While we did not collect data regarding the race and ethnicity of physicians, and did not have a direct measure of the need or use of interpreter services, we did ask Spanish-speaking patients to report whether their physician spoke Spanish and included this in our multivariate models. Furthermore, we did not find any interactions between FHL, patients' language, and IPC reports. Because our prior work and the work of others [22,49] have demonstrated that patients with inadequate FHL have worse health status, and since prior studies have shown that health status affects physician communication and patient satisfaction [50,51], we attempted to include health status in our models. While we did not have a direct measure of patients' health status, we included three variables that are linked to overall health, particularly in patients with diabetes: medication regimen, metabolic control (HbA1c), and depressive symptoms (CESD-10) [35]. Third, while IPC is considered a quality of care measure in its own right [1,4], we have not yet examined the extent to which IPC may act as a mediator between FHL and other diabetes-related outcomes, including self-care, self-efficacy, metabolic control, and health services utilization. Because IPC may also directly affect these outcomes, answering this research question would require more sophisticated modeling and analytic techniques. Fourth, since our study involved patients cared for at public hospital clinics, our findings may not be generalizable to patients who receive their care in different settings. Finally, we may have underestimated the extent of communication problems among diabetes patients in our public hospital, insofar as our eligibility criteria and recruitment procedures excluded patients who were unaffiliated with or only inconsistently cared for by a primary care physician, as well as those who missed a clinic appointment with their physician during the study period.

5. Practice implications

Since type 2 diabetes disproportionately affects ethnic minorities, the elderly, and those of lower socioeconomic status [52], understanding the relationship between FHL and the quality of interpersonal processes of care may provide important insights for clinicians who care for such populations, and may have strategic implications for the reduction of racial, ethnic, and socioeconomic disparities in diabetes care called for in Healthy People 2010 [53]. To date, potential solutions to the problem of low FHL have focused on improving the readability of written documents or replacing printed materials with other forms of health communication [54,55]. Although these efforts, no doubt, will lead to helpful changes in the health care experience of patients with poor FHL, our study suggests that these patients are more likely to experience global communication problems in the health care context. While our study does not illuminate how clinicians can best adapt their communication style for patients with poor FHL, it does reveal problems that deserve attention and suggests avenues for fruitful inquiry. In the explanatory domain of communication, it appears that patients with inadequate FHL are more likely to be challenged by both the technicality and the speed with which information is transmitted by their physician. In the participatory domain of physician communication, it is evident that physicians are not uniformly ascertaining the extent to which their educational efforts lead to the intended consequences. Research is needed as to how to most effectively transmit complex health information to patients with poor FHL. To promote more interactive and dialogical communication [24,56], work is needed to examine ways

that physicians can elicit a patient's comprehension or perceptions and patients can safely voice their informational needs.

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