The Impact of Health Literacy on Desire for Participation in Healthcare, Medical Visit Communication, and Patient Reported Outcomes among Patients with Hypertension

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BACKGROUND: Low health literacy (HL) is associated with poor healthcare outcomes; mechanisms for these associations remain unclear.

OBJECTIVE: To elucidate how HL influences patients' interest in participating in healthcare, medical visit communication, and patient reported visit outcomes.

DESIGN, SETTING, AND PATIENTS: Cross-sectional study of enrollment data from a randomized controlled trial of interventions to improve patient adherence to hypertension treatments. Participants were 41 primary care physicians and 275 of their patients. Prior to the enrollment visit, physicians received a minimal intervention or communication skills training and patients received a minimal intervention or a pre-visit coaching session. This resulted in four intervention groups (minimal patient/minimal physician; minimal patient/ intensive physician; intensive patient/minimal physician; and intensive patient/intensive physician).

MEASUREMENTS: Rapid Estimate of Adult Literacy in Medicine; patients' desire for involvement in decision making; communication behaviors; patient ratings of participatory decision making (PDM), trust, and satisfaction.

RESULTS: A lower percentage of patients with low versus adequate literacy had controlled blood pressure. Both groups were similarly interested in participating in medical decision making. Communication behaviors did not differ based on HL except for medical question asking by patients, which was lower among low literacy patients. This was particularly true in the intensive patient /intensive physician group (3.85 vs. 6.42 questions; *p*=0.002). Overall, ratings of care didn't differ based on HL; however, in analyses stratified by intervention assignment, patients with low literacy in minimal physician intervention groups reported significantly lower PDM scores than adequate literacy patients.

CONCLUSIONS: Patients with low and adequate literacy were similarly interested in participating in medical

decision making. However, low literacy patients were less likely to experience PDM in their visits. Low literacy patients in the intensive physician intervention groups asked fewer medical questions. Patients with low literacy may be less able to respond to physicians' use of patient-centered communication approaches than adequate literacy patients.

KEY WORDS: health literacy; participatory decision making; patient-physician relationship; communication.
J Gen Intern Med 28(11):1469–76
DOI: 10.1007/s11606-013-2466-5
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INTRODUCTION

More than one third of the U.S. adult population has limited health literacy (HL).¹ Two-thirds of the elderly population suffer from this problem, and in one study conducted at a public hospital, 81 % of elderly patients could not interpret medication labels.^{2–5} Limited HL impedes performance of essential self-care tasks such as taking medications as prescribed,¹ and is associated with increased utilization of healthcare services and poor healthcare outcomes.^{6–10}

HL is defined as the "degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions".^{11,12} Much has been done over the past two decades to study HL and its impact on patient outcomes.¹³ Whereas some studies suggest that HL exerts its impact on patient outcomes via inadequate self-management skills, others point to a role for reduced patient participation and shared decision making during medical interactions.^{14–16} One mixed methods study found that low literate patients are less likely to ask questions and seek additional information.¹⁷ It is unclear, however, why that is the case. Thus, it is important to elucidate the perspectives of low literacy patients on participating in their healthcare and to

Received May 18, 2012 Revised October 30, 2012 Accepted March 27, 2013 Published online May 21, 2013

comprehensively describe the communication that occurs between these patients and their physicians. Such understanding is necessary to develop effective interventions to improve the interpersonal care that low literacy patients receive and to possibly reduce the negative impact that low literacy has on patient outcomes.

We hypothesized that: 1) patients with low literacy and those with adequate literacy would have similar levels of desire for participation in medical decision making; 2) communication behaviors during the visits of patients with low literacy would reflect lower levels of patient participation and more verbal dominance by physicians; and 3) patients with low literacy would report lower levels of satisfaction, trust, and participatory decision-making (PDM) than patients with adequate literacy.

METHODS

We conducted a cross-sectional analysis using enrollment data from the Patient-Physician Partnership (TRI-PLE P) Study, a randomized controlled trial designed to evaluate the effectiveness of intensive patient and physician targeted interventions for improving adherence among hypertensive patients.^{18,19} The intensive physician intervention involved patient-centered communication skills training and was completed prior to patient enrollment visits. The intensive patient intervention included a 20-minute coaching session with a community health worker prior to the enrollment visit and follow-up phone calls over a 1-year period. The coaching session focused on patient communication skills related to engagement, activation, and empowerment. All physicians (intensive and minimal intervention groups) received a copy of the JNC-VII treatment guidelines at the beginning of the study, and a monthly newsletter with study updates and summaries of recent journal articles. All patients (intensive and minimal intervention groups), received a monthly health education newsletter designed to meet the needs of low literate adult readers. Study participants were 41 primary care physicians and 279 of their patients at 14 primary care sites serving low income and minority patients in Baltimore, Maryland. Detailed descriptions of TRIPLE P methods are reported elsewhere.^{18,19} The study was approved by the Johns Hopkins Institutional Review Board. Eligible patients (adults with an ICD-9 diagnosis of hypertension) completed a pre-visit survey at their enrollment visit with their physician, including data on demographics and interest in being involved in their healthcare.²⁰ Blood pressure was measured before the visit using an automatic oscillometric monitor (Omron HEM 907) and a standardized protocol. Enrollment visits were audiotaped and patients completed post-visit surveys.

Main Measures

Our independent variable was HL status, measured using the Rapid Estimate of Adult Literacy in Medicine (REALM).²¹ Patients with scores ≤ 60 (which correspond to a reading level less than 9th grade) were considered to have low literacy. Those with scores > 60 were considered to have adequate literacy. Our dependent variables were measures of: 1) patients' desire for involvement in medical decision making, as rated by a single item on the patient survey; 2) patient–physician communication behaviors obtained from audiotapes of enrollment visits and analyzed using the Roter Interaction Analysis System (RIAS); 3) patient ratings of care including post-visit reports of their physician's PDM style, trust in their physician, and satisfaction with the visit.

Patient Desire to Participate in Decision Making. The patient's desire to participate in medical decision making was measured using the following item: "What role would you like to play when seeing your doctor?" The four response options were: 1) the doctor takes the initiative and decides what is best for me; 2) the doctor considers some of my ideas but still makes most, if not all, of the final decisions; 3) the doctor and I make the final decisions together; and 4) I make all of the final decisions.²² Patients were considered to desire an active role in their care if they wanted to make "all final decisions together" with their doctor or to make "final decisions alone".

Patient-Physician Communication. Communication behaviors during the enrollment visit were assessed using the RIAS, a valid and reliable coding system of the medical visit dialogue that assigns each statement made by the physician or patient to one of 37 mutually exclusive and exhaustive categories.^{23–29} These categories span both the technical and affective dimensions of the medical visit and are further grouped into composite measures for questionasking (biomedical and psychosocial), information giving (biomedical and psychosocial), patient activation and engagement, and rapport-building. Visit summary measures include verbal dominance ratio (the ratio of physician to patient statements), length of visit, and total number of statements made by the patient and physician. RIAS coders also provide a subjective assessment of the global affect for the visit via assigning a rating on a scale of 1-6 (1 = low/none, 6 = high) for both the patient and physician across several affect dimensions (e.g., friendliness, respectfulness). Coding was conducted by two trained coders. Coder training included 50 h of intensive instruction and over 300 h of supervised practice by the RIAS trainer. The average inter-coder reliability calculated on a subset sample of 23 interviews was 0.88 for physician and 0.79 for patient verbal behaviors (range 0.63-0.96) and 0.87–1.0 for affect ratings.

Our main outcome variables from the visit dialogue analysis were: total number of statements for each composite measure, mean patient and physician affect ratings, verbal dominance ratio, and total number of statements. We counted the number of statements for each composite as follows: 1) Question-asking, biomedical and psychosocial; 2) Information giving, biomedical and psychosocial; 3) Facilitation and patient activation; and 4) Rapport-building. Patient positive affect was calculated as the mean rating for a patient's attentiveness, warmth, respectfulness, assertiveness, responsiveness, and empathy. Physician positive affect was calculated as the mean rating for a physician's attentiveness, warmth, respectfulness, responsiveness, empathy, and non-hurried behaviors. Physician negative affect was calculated as the mean rating for hurried and dominance behaviors.

Patient Ratings of Care. Patients rated their physician's approach to PDM immediately after the visit using the 3item PDM scale developed by Kaplan.^{30,31} The questions ask patients when a decision is to be made about their treatment, how often the physician gives them choice, control and responsibility. The validity and reliability of this scale has been documented. Higher PDM scores are associated with higher patient satisfaction and continuity of care.³¹ To measure patient trust in physician, we used five items from the Trust in Physicians Scale: 1) "I trust this doctor to look out for my best interests", 2) "I have confidence in this doctor's knowledge and skills", 3) "I trust [physician's name] to tell the truth about my health", 4) "I trust this doctor to keep what I tell him or her confidential", and 5) "I trust this doctor to put my medical needs above all other considerations when treating my medical problems". There were five possible responses for each question: "completely", "mostly", "somewhat", "a little", and "not at all". Patients were considered to have "complete trust" in their physician if they responded "completely" to all five questions.³² To measure satisfaction with the visit, we asked patients to rate on Likert scales of 1 (strongly disagree) to 5 (strongly agree) whether they were "satisfied with this visit" and "would recommend physician to a friend".³³ Because the responses were positively skewed, as in previous studies, we categorized them as strongly agree vs. all other responses.

Statistical Analysis

Patient and physician characteristics by literacy group were summarized using frequencies and percentages or means and SDs. The groups were compared using Fisher's exact tests for categorical data, Jonckheere-Terpstra tests for ordinal responses, and two sample t-tests for continuous measures. The distributions of continuous outcome measures were assessed for normality and, if appropriate, log transformations were performed. Generalized linear models regression analysis with generalized estimating equations (GEE) was used to assess the effect of literacy status on the outcomes, while adjusting for patient and physician characteristics and accounting for the nesting of patients within physicians. Appropriate distributions were specified in these models (i.e., binary for dichotomous outcomes, normal for normally distributed outcomes and Poisson for count outcomes). Robust standard errors were obtained to calculate 95 % CIs. We adjusted for patient race and gender; physician gender; and patient blood pressure control status in our analyses based on their established associations with communication and patient reported outcomes in the literature. We included patient and physician intervention assignment as main effects and added the interaction of each with literacy in the models. In order to better understand the effect of literacy and intervention assignment, we repeated the analyses stratifying by patient and physician intervention groups for all measures that differed by HL status or showed significant main or interaction effects using a cut off p value of < 0.1. Analyses were performed using SAS version 9.22 and 9.3 (SAS Institute, Inc., Cary, North Carolina). All reported P values are twosided and significance was set at p < 0.05.

RESULTS

Study Sample

Of the 279 patients enrolled in the study, four patients did not complete the REALM questions because of time constraints and were excluded from this analysis. The primary language of the majority of patients was English. Table 1 depicts study participants and their physicians' characteristics according to literacy status. Compared to low literacy patients, a higher percentage of adequate literacy patients were white, had a high school degree and had higher annual income. A significantly lower percentage of low literacy patients achieved blood pressure control as defined by JNC-7 guidelines.³⁴

Desire to Participate in Decision Making

Table 2 depicts the distribution of the patients' desire to participate in decision making by literacy status. Both low and adequate literacy patients showed similar desire to participate in medical decision making, with more than twothirds of the patients in each group desiring to make decisions together with their doctor or on their own.

Patient–Physician Communication Behaviors

Table 3 depicts the association of patient health literacy with communication behaviors during the visit. There were no significant differences in physician question asking,

Table 1. Characteristics of the Study Sample

	All study participants (n=275)	Low health literacy* (n=102)	Adequate health literacy† (n=173)	P value
Patient character	ristics			
Age in years, mean (SD)	61.2 (11.8)	62.0 (11.8)	60.8 (11.8)	0.44
Female, N (%)	181(65.8)	60 (58.8)	121 (69.9)	0.07
White, N (%)	101(36.7)	22 (21.6)	79 (45.7)	< 0.001
High school degree, N (%)	189/274(69.0)	47/Ì01 (46.5)	142 (82.1)	< 0.001
Annual Income <\$10,000, N (%)	96/259 (37.1)	44/96 (45.8)	52/163 (31.9)	0.03
Annual Income <\$35,000, N (%)	188/260 (72.3)	84/96 (87.5)	104/164 (63.4)	< 0.001
Insured, N (%)	248 (90.2)	88 (86.3)	160 (92.5)	0.14
Insurance pays	254/274	93/Ì01	161 (93.1)	0.81
prescriptions, N (%)	(92.7)	(92.1)	~ /	
Blood pressure	132/271	40/101	92/170	0.02
controlled, [‡] N (%)	(48.7)	(39.6)	(54.1)	
Characteristics o	f physicians see	en by study pa	atients	
Age of physician seen, mean (SD)	43.4 (8.1)	43.4 (8.3)	43.4 (8.1)	0.97
Seen by female physician, N (%)	149 (54.2)	48 (47.1)	101 (58.4)	0.08
Seen by white physician, N (%)	125 (45.4)	42 (41.2)	83 (48.0)	0.71

*Low health literacy category includes patients scoring ≤ 60 on the REALM instrument

 \dagger Adequate health literacy category includes patients scoring > 60 on the REALM instrument

‡Blood pressure (BP) was considered controlled if systolic BP< 140 mmHg and diastolic BP<90 mmHg, or systolic BP<130 mmHg and diastolic BP<80 mmHg (if the patient had diabetes or chronic kidney disease)

education/counseling, facilitation, rapport-building statements, or affect ratings between the low and adequate literacy patients. Neither were there any significant differences in physician affect ratings. Likewise, there were no significant differences in patient informationgiving behaviors, rapport building statements, or affect ratings. There was one statistically significant difference in patient communication behaviors pertaining to question asking. As depicted in Table 3, the adjusted analysis revealed that patients with low literacy asked their physicians fewer questions about medical, but not psychosocial, issues. There were no statistically significant differences in total number of patient or physician statements, visit length, or verbal dominance ratio between the two literacy groups.

Patient Ratings of Care

Satisfaction with the visit and likelihood of recommending physician was similar between high and low literacy groups

Table 2. Patients' Desire for Involvement in C	are
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Involvement in care measure	Low health literacy*	Adequate health literacy†	P value
Unadjusted analysis			
Role patient wished to	n=102	n=173	0.32
play, N (%)			
- Doctor takes the initiative	13 (12.8)	23 (13.3)	
and decides what is best			
for me			
- Doctor considers my ideas	16 (15.7)	31 (17.9)	
but still makes most, if not			
all, of the final decisions			
- Doctor and I make final	66 (64.7)	116 (67.0)	
decisions together			
- I make all the final decisions	7 (6.9)	3 (1.7)	
Adjusted analysis‡			
Patient's desire to participate	76.4	66.4	0.18
actively in care, [§] predicted	(66.2–84.2)	(58.1 - 73.7)	
probability % (95 % CI)			

*Low health literacy category includes patients scoring ≤ 60 on the REALM instrument

 \dagger Adequate health literacy category includes patients scoring > 60 on the REALM instrument

[‡]Adjusted for patient characteristics of race, gender and blood pressure control, and physician gender and including patient and physician intervention groups and interaction of each with literacy [§]Desire to participate in care is defined as "active" if patients want to make "all final decisions together" with their doctor or to make "final decisions alone", versus passive if patients want the doctor to decide for them or the doctor to consider their ideas, but still make most decisions

(Table 4). Patients in both literacy groups reported similarly high levels of trust in their physicians.

Intervention Group Stratified Analyses

Stratification by intervention group (see Table 5) revealed that 'patient question asking' was similar between low and adequate literacy patients in minimal physician intervention groups. However, among patients whose physicians received the communication training intervention, adequate literacy patients asked more medical questions than low literacy patients. This difference reached statistical significance only in the intensive patient/ intensive physician group. Similar analysis on PDM revealed statistically significant differences in PDM scores by literacy group (Table 5). Patients with low literacy reported lower PDM scores than those with adequate literacy in minimal physician intervention groups. PDM scores reported by low literacy patients were similar across all four intervention groups; however, PDM scores for adequate literacy patients were paradoxically lower in the groups where physicians received the communication training intervention.

DISCUSSION

In this study of urban patients with hypertension in primary care settings, we found that patients with low literacy were as interested in participating in decision making as their

RIAS measure	Low health literacy† (n=86)	Adequate health literacy‡ (n=147)	P value*
	Mean estimate (95 % CI)	Mean estimate (95 % CI)	
Patient behaviors			
Question-asking, medical	4.46 (3.37–5.89)	6.82 (5.90–7.89)	0.02
Question-asking, psychosocial	0.61 (0.36–1.03)	0.90 (0.65–1.25)	0.23
Information-giving, medical and psychosocial	98.9 (81.2–120.4)	104.3 (91.6–118.8)	0.68
Patient activation	4.29 (3.38–5.44)	5.09 (4.28–6.06)	0.31
Patient positive affect	3.32 (3.23–3.40)	3.24 (3.16–3.32)	0.24
Total number of statements	156.2 (131.6–185.3)	168.3 (149.0–190.1)	0.50
Physician behaviors	(
Question-asking, medical	24.7 (19.3–31.5)	25.5 (21.3–30.5)	0.83
Question-asking, psychosocial	7.77 (5.87–10.28)	7.05 (5.93–8.38)	0.48
Information giving, medical and psychosocial	85.9 (70.2–105.0)	92.8 (78.7–109.5)	0.29
Facilitation/patient activation	24.2 (18.9–31.2)	24.5 (21.4-28.1)	0.92
Physician positive affect	3.44 (3.35–3.54)	3.40 (3.30–3.50)	0.54
Physician negative affect	3.28 (3.20–3.36)	3.27 (3.18–3.36)	0.88
Total number of statements	197.2 (168.0–231.5)	203.7 (177.5–233.8)	0.64
Overall communicatio	n		
Visit length in minutes	13.5 (11.7–15.7)	14.4 (12.7–16.4)	0.40
Verbal dominance ratio	1.51 (1.30–1.75)	1.42 (1.25–1.61)	0.55

Table 3. The Association of Patient Health Literacy with Patientand Physician Communication Behaviors among Urban PrimaryCare Patients with Hypertension

*Adjusted for patient characteristics of race, gender and blood pressure control, and physician gender and including patient and physician intervention groups and the interaction of each with literacy \pm Low health literacy category includes patients scoring \leq 60 on the REALM instrument

‡Adequate health literacy category includes patients scoring > 60 on the REALM instrument

counterparts with adequate literacy; however, they were less likely to experience PDM in their medical visits. Patient and physician communication behaviors were similar regardless of patients' literacy level, except for patient medical questions. Differences in medical question asking existed between low and adequate literacy patients in the groups where physicians received patient-centered communications training.

Previous work has shown that low literacy patients ask fewer questions perhaps because of fears of being "judged" by physicians as having limited ability to understand medical information.^{17,35} Low literate patients report less understanding of their condition and the process of care than adequate literacy patients.³⁶ Although targeted methods for putting patients at ease and encouraging them to ask their questions could theoretically help, the inability
 Table 4. The Association of Patient Health Literacy with Ratings of Care among Urban Primary Care Patients with Hypertension

Measure	Low health literacy†	Adequate health literacy‡	P value*
Patient ratings of care Patient trusts physician- predicted probability of 'complete trust' rating (95% CI)	63.7 (46.6–77.9)	71.7 (62.6–79.3)	0.45
Patient satisfied with visit - predicted probability of 'strongly agree' rating (95 % CI)	50.6 (35.4–65.8)	46.2 (33.9–59.0)	0.73
Patient recommends physician to friend - predicted probability of 'strongly agree' rating (95 % CI)	26.3 (15.6–40.8)	32.4 (22.4–44.2)	0.56
Patient reported participatory decision making on the 3-item scale (range from 0–100) Mean score (95 % CI)	67.8 (61.3–74.4)	71.4 (66.7–76.1)	0.45

*Adjusted for patient characteristics of race, gender and blood pressure control, and physician gender and including the patient and physician intervention groups and the interaction of each with literacy $\pm Low$ health literacy category includes patients scoring ≤ 60 on the REALM instrument

#Adequate health literacy category includes patients scoring > 60 on the REALM instrument

of physicians to accurately identify patients with low literacy³⁷ limits their ability to use targeted approaches. The TRIPLE P trial delivered patient-centered interventions to physicians and to patients regardless of literacy status;^{18,19} however, the impact of these interventions was different for patients with low and adequate health literacy. Similar findings have been reported previously,³⁸ highlighting the need for additional research on interventions that target low literacy patients and are amenable to implementation in real clinical settings. The difference in patient medical question asking by HL status (in the groups where physicians received communication training) suggests that patients with low literacy may be less able than those with adequate literacy to respond to physicians' use of patientcentered communication strategies. Effective strategies to engage low literacy patients should be investigated further and incorporated in patient activation and physician communication skills training programs.

Patients with low and adequate literacy were similarly interested in being involved in PDM; however, low literacy patients in both the minimal patient/ minimal physician intervention and the intensive patient/ minimal physician group reported lower PDM scores compared to adequate literacy patients. This may relate to the actual challenge that low health literacy poses with regard to having clear and meaningful two-way conversation about treatment options and alternatives. Physicians' use of complicated language serves to compound this problem. It is also possible that low health literacy patients' ratings of PDM may be

 Table 5. Stratified Analysis by Study Intervention Group for the Association of Patient Health Literacy with Select Communication Behaviors and Visit Outcomes among Urban Primary Care Patients with Hypertension

Measure	Intervention group				
	Minimal patient/ minimal physician	Intensive patient/ minimal physician	Minimal patient/ intensive physician	Intensive patient/ intensive physician	
Patient medical qu	uestion asking - mean estimate (95 % CI)				
N	50	45	67	68	
low HL	5.21 (4.07-6.67)	5.93 (3.43-10.24)	4.93 (2.67-9.11)	3.85 (2.84-5.22)	
Adequate HL	5.04 (3.80-6.67)	5.14 (3.90-6.79)	7.60 (6.16–9.38)	6.42 (5.15-8.00)	
p value	0.88	0.61	0.18	0.002	
Physician number	of statements - mean estimate (95 % CI)				
Ň	50	45	67	68	
Low HL	217 (174–271)	212 (164–276)	182 (141–235)	182 (150-222)	
Adequate HL	230 (191–277)	236 (168–332)	208 (174–248)	189 (157–227)*	
p value	0.29	0.53	0.20	0.69	
Patient reported participatory decision making - mean score (95 % CI)					
N	55	54	75	78	
low HL	65.1 (51.7–78.5)	58.3 (45.0-71.6)	68.5 (62.5-74.5)	65.2 (57.5-73.0)	
Adequate HL	80.3 (75.1-85.5)	73.6 (67.6–79.6)	69.9 (64.0–75.9)*	69.5 (61.9–77.2)*	
p value	0.04	0.048	0.76	0.43	

Model is adjusted for patient race, gender and blood pressure control and physician gender

*P < 0.05 compared to the reference group of minimal patient/minimal physician intervention within literacy group

affected by any negative feelings that they may have about their own engagement in decision making during the medical visit. The finding of lower PDM scores among adequate literacy patients within groups where physicians received communications training compared to the minimal/ minimal group is counterintuitive. The study interventions may have raised patient expectations of their physicians differently for patients with low versus adequate health literacy. Future research should assess the long term impact of such interventions on patient reported outcomes for patients with low and adequate literacy.

This study has several limitations. First, patients and physicians knew that they were being audio taped, which may have influenced their communication behaviors. However, it is not likely that this would have differed by patients' literacy status. Moreover, earlier studies of physician behaviors have not revealed significant differences between visits where physicians are and are not aware of being recorded.^{39,40} Second, since we used audio recordings, we may have failed to detect subtle differences in physician non-verbal behaviors. However, comparisons of global affect ratings based on voice tone quality revealed no differences between adequate and low literacy groups. Third, this study was limited to patient-reported visit outcomes and did not assess impact of literacy on clinical outcomes. We did document that patients with low literacy had poorer baseline blood pressure control; however, given the cross-sectional design of this study, our ability to draw causal inferences based on this finding is limited. Fourth, the small number of low literacy patients in each intervention group may have limited our ability to detect statistically significant differences within and across intervention groups. Fifth, we used a 9th grade reading level cut off to define low versus adequate literacy. This meant that the 'low literacy' group included patients with just below

adequate literacy skills, which may have diminished our ability to detect differences between groups. Finally, existing HL measures are limited in their ability to capture the various dimensions of HL.⁴¹ The REALM measure, used in this study,²¹ only assesses word recognition. HL, however, is a multidimensional concept that encompasses ability to communicate, seek and process scientific information, and make judgments to address real life challenges.^{42–45} More comprehensive measures of HL are needed.

In conclusion, our study revealed that the majority of patients with hypertension in an urban primary care setting desire to be involved in medical decision making regardless of their literacy status. However, patients with low literacy report less PDM in their medical visits than their counterparts with adequate literacy. Physician and patient communication behaviors during medical visits are largely similar among low and adequate literacy patients, except for medical question asking by patients. Low literacy patients asked fewer medical questions in the intensive intervention groups where physicians received patient-centered communication training. Additional research is needed to assess the long term impact of interventions targeting low literacy patients to improve patient-physician communication. This work will require the use of rigorous methods and trans-disciplinary collaboration among literacy, communication, and health disparities researchers. Such efforts will also help inform the development of interventions to reduce disparities in care and enhance patient-reported and clinical outcomes for this high-risk population.

Acknowledgements: This work was supported by grants from the National Heart, Lung, and Blood Institute (R01HL069403, K24HL083113, and P50HL105187).

Conflict of Interest: Dr. Aboumatar has no conflict of interest. Ms. Karson has received grant support from Gilead Sciences for a pulmonary research grant. Dr. Roter is the author of the Roter Interaction Analysis System (RIAS) and holds the copyright for the system. Johns Hopkins University also has rights to the RIAS coding software. Neither Debra Roter nor Johns Hopkins collects royalties for use of the system in research. Dr. Roter is also the co-owner of RIASWorks LLC, a company that provides RIAS coding services for non-university projects. It is possible that RIASWorks would benefit indirectly from dissemination of the current research. Dr. Beach has received honoraria from Merck for giving non-product based presentations on doctor-patient communication and relationship-centered care. Dr. Cooper has served as consultant for Talaria, Inc. Training, Research, & Healthcare Education in August 2010.

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