Limited Health Literacy is a Barrier to Medication Reconciliation in Ambulatory Care

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BACKGROUND: Limited health literacy may influence patients' ability to identify medications taken; a serious concern for ambulatory safety and quality.

OBJECTIVE: To assess the relationship between health literacy, patient recall of antihypertensive medications, and reconciliation between patient self-report and the medical record.

DESIGN: In-person interviews, literacy assessment, medical records abstraction.

PARTICIPANTS: Adults with hypertension at three community health centers.

MEASUREMENT: We measured health literacy using the short-form Test of Functional Health Literacy in Adults. Patients were asked about the medications they took for blood pressure. Their responses were compared with the medical record.

RESULTS: Of 119 participants, 37 (31%) had inadequate health literacy. Patients with inadequate health literacy were less able to name any of their antihypertensive medications compared to those with adequate health literacy (40.5% vs 68.3%, $p=0.005$). After adjusting for age and income, this difference remained (adjusted odds ratio [OR]=2.9, 95% confidence interval [95%CI]=1.3–6.7). Agreement between patient reported medications and the medical record was low: 64.9% of patients with inadequate and 37.8% with adequate literacy had no medications common to both lists.

CONCLUSIONS: Limited health literacy was associated with a greater number of unreconciled medications. Future studies should investigate how this may impact safety and hypertension control.

KEY WORDS: health literacy; medication reconciliation; medication adherence; hypertension; knowledge; ambulatory care.

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Promoting agreement between physicians and patients as to which medications a patient is using and in what manner, known as *medication reconciliation*, has been identified as a target for improving the quality and safety of health care.^{1–3} The inpatient setting, in particular, is the context where reconciliation has usually been described. Through the process of medication reconciliation, health care providers can improve patient care by reducing adverse drug events and medication errors (by conflict or unintentional omission) that account for \$3.5 billion in hospital costs each year.⁴ However, the Institute of Medicine (IOM) 2006 report, *Preventing Medication Error*, recommended attention be directed to outpatient settings as well. One third of the 1.5 million adverse drug events occur in ambulatory care, at a cost approaching \$1 billion annually.⁴

Current evidence detailing the causes of outpatient medication error is limited, yet unreconciled medicine regimens may be a root cause.^{5,6} From a provider/system perspective, research suggests that physicians are missing opportunities to communicate with patients about medicine regimens.^{7,8} As a result, information in the medical record may not be accurate and current. From the patient perspective, limited health literacy might be a less-recognized barrier to medication reconciliation.⁹ Prior studies have shown that patients with limited health literacy have a poorer understanding of prescription medication names, indications for use, and instructions.^{10–13} We sought to document the prevalence of medication discrepancies and determine whether limited health literacy was significantly associated with reconciliation problems.

METHODS

Setting and Participants

Consecutive patients with diagnosed hypertension and scheduled appointments were recruited from three primary care clinics in Grand Rapids, Michigan affiliated with a federally qualified health center. Study procedures were approved by the institutional review board at Michigan State University, and participants provided informed consent. Eligible participants were at least 18 years old, had a diagnosis of hypertension in the medical record, and a clinic appointment between July 2005 and March 2006. Patients were ineligible if they did not speak English or if the clinic nurse determined (by interaction or chart documentation) that they were too ill or

cognitively impaired to participate. Nurses reviewed medical records of scheduled patients, identified those potentially eligible for the study, and referred them to study staff who met with interested patients, obtained consent, and scheduled in-person interviews.

PROCEDURE

We assessed health literacy with the short version of the Test of Functional Health Literacy in Adults (S-TOFHLA).^{14,15} Patients are classified as having inadequate, marginal, or adequate health literacy skills. For this small study, we defined patients as having either inadequate health literacy or marginal/adequate health literacy. Although prior findings are mixed regarding associations between health outcomes and marginal health literacy, these individuals more often appear to be similar to those with adequate rather than inadequate literacy.¹⁶⁻¹⁸

Patients were asked to report how many different medications they were taking for high blood pressure and to name them. A trained chart abstractor recorded the most recent blood pressure and current medications from the medical record retrospectively. A physician determined which of these were antihypertensive medications. We compared the lists of antihypertensive medications named by the patient with those in the medical record and classified these comparisons as containing all, some, or no medications in common. We also classified patients as being able or unable to name any of their antihypertensive medications.

Analysis

Data was analyzed using the SAS (version 9.1). Categorical data were compared using χ^2 or Fisher's exact test. We compared normal continuous variables with the Student's *t*-test. We used multivariable logistic regression to examine the relationship between health literacy and ability to name antihypertensive medications adjusted for age (<60 vs ≥ 60 years) and household income (<\$10,000, $\geq$ \$10,000, or missing).

RESULTS

A total of 161 eligible patients were approached, and 119 consented to be interviewed (73.9%). No differences were noted by age between participants and nonparticipants (55.3 vs 56.2 years, $p=0.46$). Among those interviewed, 69.5% were women, 60.5% were black, 33.6% were white, and 5.8% were another race/ethnicity. 39.0% completed less than a high school education and 45.5% reported annual household incomes less than \$10,000. One third (31.1%) had inadequate health literacy according to the S-TOFHLA. These patients tended to be older and had completed fewer years of schooling than patients with adequate health literacy (Table 1).

Medical records indicated that hypertension patients with inadequate health literacy were more likely than patients with adequate health literacy to be prescribed two or more antihypertensive medications (81.1% vs 53.7%, $p=0.004$). However, health literacy was not associated with the number of antihypertensive medications patients reported taking (two or more: 56.8% vs 47.6%, $p=0.35$). Only 22.7% of patients could name

Table 1. Participant Characteristics and Antihypertensive Medication Use, by Health Literacy

Variable	All patients (N=119)	Inadequate health literacy (n=37)	Marginal/adequate health literacy (n=82)	P value
Age, mean (SD)	55.3 (12.6)	58.4 (12.5)	53.8 (12.5)	0.07
Age ≥ 60 y (%)	36.1	48.7	30.5	0.07
Female sex (%)	69.5	64.9	72.0	0.52
Race (%)				0.07
Black	60.5	73.0	54.9	
White	33.6	18.9	40.2	
Other	5.8	8.1	4.9	
Years of school completed (%)				<0.0001
Less than 8th grade	11	18.9	7.3	
Grades 9-11	28	54.1	15.9	
High school or general equivalency diploma	26.3	16.2	30.5	
>High school	34.8	10.8	46.3	
Income (%)				0.14
<\$10,000	42.0	54.1	36.6	
$\geq$ \$10,000	45.4	32.4	51.2	
Refused	12.6	13.5	12.2	
Number of antihypertensive medications documented in medical record (%)				0.02
0	6.7	0	9.8	
1	31.1	18.9	36.6	
2	32.8	46.0	26.8	
3 or more	29.4	35.1	26.8	
Number of antihypertensive medications patient reports taking (%)				0.34
0	5.2	0	7.5	
1	43.1	41.7	43.8	
2	26.7	27.8	26.3	
3 or more	25.0	30.6	22.5	
Number of current antihypertensive medications patient can name (%)				0.03
0	40.3	59.5	31.7	
1	37.0	27.0	41.5	
2	13.5	10.8	14.6	
3 or more	9.2	2.7	12.2	

two or more of their antihypertensive medications, and 40.3% could not name any of these medicines. Patients with inadequate health literacy named fewer antihypertensive medications than those with adequate health literacy (Table 1) and were more likely to be unable to name any antihypertensive medication they were taking (59.5% vs 31.7%, odds ratio [OR]=3.2, 95% confidence interval [95%CI]=1.4-7.1). After adjusting for age and income, this difference remained (adjusted OR=2.9,

95%CI=1.3–6.7). Further adjustment for race and years of school completed did not appreciably alter this relationship.

The agreement between patient-reported and medical record-reported antihypertensive medications was lower for patients with inadequate compared to adequate health literacy (Table 2). For 64.9% of patients with inadequate health literacy and 37.8% with adequate health literacy, there were no antihypertensive medications common to the patient-reported and record-abstracted lists (Table 2).

Patients with inadequate health literacy were less likely to have blood pressure below 140/90 mm Hg compared to those with adequate literacy, but this difference was not significant (59.1% vs 70.7%; $p=0.096$) (Table 2). Blood pressures were higher for patients with inadequate health literacy (difference of 5.2/2.2 mmHg) but these differences also were not significant.

DISCUSSION

Medication reconciliation problems were highly prevalent among patients receiving hypertension care at three federally qualified health centers. Patients frequently could not name their antihypertensive medications, and there was little agreement between antihypertensive medications in the medical record and those named by patients. These deficits were particularly striking for patients with inadequate health literacy. Of these patients, 60% could not name any antihypertensive medications and nearly two thirds named no antihypertensive medication that was recorded in their medical record. Inadequate health literacy may therefore pose a

major obstacle to patients and their providers as they attempt to reconcile medications used for hypertension.

Being unable to state which medications they are using by name (and also by dose) could be especially important when patients interact with health care providers other than their usual source of outpatient care (e.g., emergency departments, inpatient settings).¹⁷ For patients routinely using safety-net providers, poor reconciliation may further complicate the challenge of coordination of care.

For chronic conditions, such as hypertension that frequently require multidrug regimens, the inability to name one's medications could increase the chance of medication errors or nonadherence. This study did not assess adherence or medication errors directly, but supports a possible association between health literacy and medication-taking behaviors. Our finding that inadequate health literacy was associated with having two or more antihypertensive medications recorded in the medical record but not with the number of antihypertensive medications patients reported taking could indicate a relationship between inadequate health literacy and nonadherence in this population. Prior findings in HIV treatment found inconclusive results as to the relationship between health literacy and medication adherence.^{10,13,18–20} Yet HIV may differ from hypertension. Antiretroviral medications generally have a single manufacturer, and a prior study found that patients with limited literacy often rely on pill characteristics for identification.²¹ This would be difficult with antihypertensive drugs, which frequently come in multiple forms from different manufacturers. Patients may be dispensed different appearing versions of the same medication from 1 month to the next. Using medications correctly by depending on pill shape, size, or color seems particularly unreliable in this case. A recent study found inadequate health literacy to be related to lower refill adherence for cardiovascular-related diseases and diabetes.²² Further research is needed to explore plausible causal pathways linking health literacy to medication errors and adherence for hypertension.

Limitations of the study should be noted. Patients were from one city, all spoke English, and all had diagnosed hypertension. How these results generalize to other populations with different medical conditions is not known. The medical record was intentionally abstracted 2 weeks after the interview, yet it is possible that the record did not contain the most up to date documentation. One might expect errors or omissions to be more prevalent in paper chart documentation compared to an electronic record. It is also possible that medical information was incomplete as patients could have received care from other sites. However, patients at federally qualified health centers have fewer resources and, therefore, may be less likely to access multiple providers. Finally, our study population was small. We were able to detect significant differences in the ability to name antihypertensive medications by health literacy status but were limited by our sample size to detect clinically meaningful differences in blood pressure.

Greater attention should be directed to medication reconciliation in ambulatory care and potential strategies to overcome related health literacy barriers. Future research should examine in detail the relationship between health literacy, medication discrepancies, and chronic disease outcomes. The efficacy of interventions to improve communication and patient recall of medicines should also be tested. At present,

Table 2. Antihypertensive Medications Reconciled and Blood Pressure Control, by Health Literacy

Variable	All patients (N=119)	Inadequate health literacy (n=37)	Marginal/adequate health literacy (n=82)	P value
Medication reconciliation				0.023
Lists identical (%)	29.4	18.9	34.2	
Some medications in common (%)	24.4	16.2	28.1	
No medications in common (%)	46.2	64.9	37.8	
Could not name any antihypertensive medications taken (%)	40.3	59.5	31.7	0.005
Blood pressure <140/90 mmHg (%)	65.6	54.1	70.7	0.096
Mean systolic blood pressure, M (SD)	133.8 (16.4)	137.4 (18.4)	132.2 (15.3)	0.11
Mean diastolic blood pressure, M (SD)	80.0 (12.2)	81.5 (11.1)	79.3 (12.6)	0.32

clinicians might also encourage patients to bring their medications with them to office visits.

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