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Is Low Health Literacy Associated with Increased Emergency Department Utilization and Recidivism?

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Abstract

Objectives—To determine whether patients with low health literacy have higher ED utilization and higher ED recidivism than patients with adequate health literacy.

Methods—The study was conducted at an urban academic ED with over 95,000 annual visits that is part of a 13-hospital health system, using electronic records that are captured in a central data repository. As part of a larger, cross sectional, convenience sample study, health literacy testing was performed using the short test of functional health literacy in adults (STOFHLA), and standard test thresholds identifying those with inadequate, marginal, and adequate health literacy. The authors collected patients' demographic and clinical data, including items known to affect recidivism. This was a structured electronic record review directed at determining 1) the median number of total ED visits in this health system within a 2-year period, and 2) the proportion of patients with each level of health literacy who had return visits within 3, 7, and 14 days of index visits. Descriptive data for demographics and ED returns are reported, stratified by health literacy level. The Mantel-Haenszel chi-square was used to test whether there is an association between health literacy and ED recidivism. A negative binomial multivariable model was performed to examine whether health literacy affects ED use, including variables significant at the 0.1 alpha level on bivariate analysis, and retaining those significant at an alpha of 0.05 in the final model.

Results—Among 431 patients evaluated, 13.2% had inadequate, 10% had marginal, and 76.3% had adequate health literacy as identified by S-TOFHLA. Patients with inadequate health literacy had higher ED utilization compared to those with adequate health literacy ($p = 0.03$). Variables retained in the final model included S-TOFHLA score, number of medications, having a personal doctor, being a property owner, race, insurance, age, and simple comorbidity score. During the study period, 118 unique patients each made at least one return ED visit within a 14-day period. The proportion of patients with inadequate health literacy making at least one return visit was higher than that of patients with adequate health literacy at 14 days, but was not significantly higher within 3 or 7 days.

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Conclusions—In this single-center study, higher utilization of the ED by patients with inadequate health literacy when compared to those with adequate health literacy was observed. Patients with inadequate health literacy made a higher number of return visits at 14 days but not at 3 or 7 days.

INTRODUCTION

Health literacy is defined by the Institute of Medicine as "the degree to which individuals can obtain, process, and understand basic health information and services they need to make appropriate health decisions,"[1] and is a major determinant of health outcomes.[2] Low health literacy (a generic term, not associated with a particular literacy test) has been associated with decreased use of preventative services,[3–8] higher utilization of acute health care services among those with chronic disease,[9] poorer health status,[4–6,8–11] and worse health outcomes, including increased hospitalization rate and mortality.[4,10,12–19] In the emergency department (ED), the prevalence of low health literacy is wide ranging, with estimates as high as 88% depending on the ED patient mix and on the screening instruments used.[20,21]

Self-reported and observed ED use has been found to be increased among Medicare[9,11,14] and pediatric[22,23] populations, and both adult[15] and pediatric[4] asthma patients with low health literacy,[21] with one recent study finding increased utilization among a general ED population.[24] However, although it has been identified as an important area for investigation in ED-based health literacy studies,[25] we are not aware of studies among a general ED population that have explored whether health literacy is associated with higher return visits to the ED after an index visit.

The extent to which low health literacy may play a role in rates of ED recidivism is unclear. For patients with low health literacy, unscheduled returns to the ED may reflect a lack of comprehension of instructions for medications, return instructions, follow-up plans, or other reasons resulting in failure of patients to activate follow-up plans as intended. The rate of unscheduled return visits to the ED, frequently within 72 hours, is a commonly tracked measure to evaluate for quality and safety, although this specific time interval and its implications are controversial in the ED literature.[26] There are no data, however, to guide how long after an ED visit patients may return for reasons related to inability to access care or lack of understanding of care plans or follow-up instructions, so casting a broader net may yield better information. If recidivism is related to low health literacy, this may present an opportunity for intervention in improving outpatient management and decreasing ED utilization.

The objective of this study was to quantify differences between patients with inadequate, marginal, and adequate health literacy regarding 1) ED utilization, and 2) return visits to the ED at 3, 7, and 14 days.

METHODS

Study Design

As part of a larger, cross sectional, convenience sample study in which we enrolled patients and performed health literacy testing,[20] we performed record review to determine ED utilization and recidivism. This study was approved by the hospital institutional review board.

Study Setting and Population

Enrollment took place between January 3, 2011 and March 18, 2012 in an urban academic ED with >95,000 annual visits that uses an electronic medical record for all documentation (Allscripts HealthMatics). All English-speaking patients 18 years and older were eligible for study participation. Patients with aphasia, psychiatric or sexual assault chief complaints, clinical intoxication, known dementia, altered mental status, mental handicap, too high acuity as determined by the treating physician, or insurmountable communication barrier were excluded. Previously enrolled patients were not eligible for subsequent enrollment.

Study Protocol

Paid research assistants and medical students received standardized training on screening for limited health literacy, consisting of an in-person presentation, review of a pre-recorded training presentation, practice sessions administering the instruments to mock patients, and monitored screening of the first patient enrollment. Training included specific instruction to avoid language that might lead to feelings of shame or embarrassment among patients with low health literacy.[27] Research assistants reviewed the electronic dashboard to identify patients for recruitment, enrolling participants at different times of the day on different days of the week, including weekends and, to a limited degree, overnights. Demographic data elements were collected during the interview and from the electronic medical record.

Patients completed the abbreviated Short Test of Functional Health Literacy (S-TOFHLA).[28] This is a timed test with a maximum of 7 minutes allowed for completion that is widely considered a criterion standard screening tool for health literacy assessments,[29] the test characteristics for which are described elsewhere.[20] Possible scores range from 0 to 36 with scores ranging from 0 to 16 reflecting inadequate health literacy, 17 to 22 marginal health literacy, and >22 adequate health literacy.

To help control for potential confounders, screeners collected clinical and demographic data including self-reported age, weight, sex, race, highest level of education, housing status, number of medications the patient takes, and tobacco and alcohol use; and performed record review in our electronic medical record for additional clinical variables to allow determination of patients' Simplified Comorbidity Score (SCS). The SCS is a weighted comorbidity scoring system that was developed as an alternative to more complex scoring systems such as the Charlson comorbidity index, in recognition that the latter is complicated and time-consuming to perform. SCS variables include alcohol and tobacco consumption; diabetes mellitus; renal insufficiency; and respiratory, cardiovascular, and neoplastic comorbidities.[30] The SCS was originally derived and validated for use in predicting

mortality among patients with non-small-cell lung cancer. Although the SCS has not been validated for evaluating utilization or recidivism in the ED setting, it is the simplest scoring system that allowed for use by research assistants without requiring extensive training and time to complete.

Research screeners also reviewed patients' data in our electronic medical record to gather additional data, including the number of visits during a two-year period to any ED in the health system, which includes 13 affiliated facilities. Data were entered into an electronic database. The electronic medical record was examined for every 3-, 7-, and 14-day return visit over a 2-year period (January 1, 2010 to December 31, 2011). We recorded whether or not each patient had at least one return visit within 3, 7, and 14 days within this period.

Outcome Measures

Our primary outcome measures included the number of ED visits between January 1, 2010 to December 31, 2011; and the proportions of patients in each health literacy stratum making at least one return visit to the ED within 3-, 7-, and 14-day time intervals following index visits during this study period.

Data Analysis

Data analysis was performed using SAS 9.4. Enrollment was directed at outcomes related to evaluating the diagnostic accuracy of the screening tools used, described in a separate study,[20] which, based on prior estimates,[21] assumed a baseline prevalence of low health literacy of 40%, verifying a sensitivity of 90% with a 5% range of error and the assumption of approximately 20% incomplete data, arriving at a sample size estimate of 430 patients. Descriptive data are presented for demographics, health literacy levels, and ED returns including medians with interquartile range values (IQRs), frequencies, and proportions (Table 1).

To examine recidivism in 3, 7, and 14 days, we used the Mantel-Haenszel chi-square to test whether there was an ordinal association between health literacy and ED recidivism. We determined significance based on an $\alpha = 0.05$ level.

We performed a multivariable regression to examine whether health literacy affects ED utilization, controlling for other possible covariates. Due to the nature of our outcome variable, observed number of ED visits (with evidence of overdispersion based on the dispersion parameter's 95% confidence intervals [CI] = 1.13 to 1.78), we used a negative binomial model. Bivariate analyses were conducted first, retaining variables significant at the 0.1 alpha level when modeled alone, and with an alpha less than 0.05 in the final multivariable model. The S-TOFHLA score, number of medications, having a personal doctor, being a property owner, race, insurance, age, and SCS were included in the model. Educational attainment and sex were tested, but did not remain in the final model. In addition to the model coefficients, we display the model estimates as incident rate ratios.

RESULTS

We approached 588 patients, enrolled a total of 446 patients, and excluded 14 patients for missing data, for a total of 431 patients. Demographic data are presented in Table 1. We found no differences in the age, sex, or race of enrolled patients when compared to excluded patients or to the 93,476 total patient visits to the ED in 2011. Among the 431 patients included, 13.2% had inadequate health literacy, 10.4% had marginal, and 76.3% had adequate health literacy, as identified by the S-TOFHLA.

Utilization

Patients had a median number of one visit to the ED in a 2-year period (IQR 0 to 2), although number of visits ranged from 0 to 73. In the negative binomial regression model, S-TOFHLA score, number of medications, having a personal doctor, being a property owner, race, insurance, age, and SCS were significantly associated with observed number of ED visits in a two-year period (Table 2). In this model, patients with inadequate health literacy had significantly more visits to the ED in the two-year period than those with adequate health literacy ($p = 0.03$). Holding all other variables constant in the model, patients with inadequate functional health literacy are expected to have a rate of ED visits 1.64 times greater compared to those with adequate functional health literacy (95% CI = 1.04 to 2.59; $p = 0.03$). The number of ED visits did not differ significantly between patients with marginal health literacy and those with adequate health literacy.

Recidivism

Overall, 118 unique patients in our study made at least one return visit within a 14-day period. We compared patients who had at least one return visit in 3, 7, and 14 days to those who did not. Health literacy and recidivism were not significantly associated within 3 days or within 7 days (Table 3). Higher recidivism within 14 days was significantly associated with inadequate health literacy ($p = 0.04$); 36.8% of patients with inadequate health literacy made return visits to the ED within 14 days compared to 33.3% of those with marginal health literacy, and 24.9% of those with adequate health literacy.

DISCUSSION

Although low health literacy is known to affect a number of health outcomes, studies of ED utilization have often focused on discrete rather than general ED populations.[21] As relates to ED utilization, Baker et al. found that among new Medicare enrollees, patients with low health literacy were more likely to have ED visits than those with adequate health literacy, and that most of this difference was due to the proportion of patients making two or more ED visits within a year after enrollment. These authors proposed that this may be due to patients with low health literacy substituting ED visits for routine office visits, perhaps due to difficulties accessing their primary care physicians (PCP), being less able to handle acute health problems on their own, or due to their physicians having more difficulty communicating with them over the telephone and feeling more comfortable sending them to the ED to be evaluated.[9]

It may seem counterintuitive that having a PCP was associated with slightly more rather than fewer ED visits (1.41 greater visit rate on average). Although the majority (>60%) of patients reported having PCPs, only a third (33%) were privately insured. Many of the uninsured patients receive care in the city's safety-net system of Federally Qualified Health Centers. The effort to provide uninsured patients with medical homes through these centers may have affected responses to the PCP question without translating into decreased ED utilization. Recent literature suggests that despite having PCPs, patients often utilize the ED for a number of reasons, including perceived urgency and the convenience and efficiency of being able to access acute unscheduled care in a 24/7 fashion.[31,32]

Beyond utilization, we are not aware of prior studies evaluating returns to the ED after index visits that include consideration of low health literacy as a potential factor. Recently it was found that low numeracy was associated with increased odds of 30-day recidivism to the hospital or ED among patients with acute heart filure,[33] but literacy and numeracy have not been commonly assessed in studies of recidivism among general ED patients.

Return ED visits have been scrutinized for decades for their potential to represent problems in quality of care such as premature discharge, missed diagnoses, or problematic treatment or discharge plans.[26,34,35] Monitoring of revisit rates has been considered for inclusion as a national safety and performance measure for emergency medical care affecting reimbursement.[26] A 72-hour time interval is a commonly used in evaluating ED revisits, in theory because of an increased potential for adverse events attributable to the care in the ED to arise within this period. However, this has been argued as arbitrary, and is but one of a number of intervals that are used in studies in this area, including 2, 7, 14, and 30 or more days.[36–41]

Studies of ED return visits have come to different conclusions as to how often revisits are preventable and how often they are due to physician, patient, or other factors.[26,36,39,42–44] Patient and system factors such as alcohol or opioid dependence, seeking food and shelter, convenience of scheduling, psychiatric disorders, limited financial or physical access to primary and specialty care, and lack of private insurance are cited among the drivers of revisits. Poor quality discharge instructions and lack of understanding are proposed as other possible drivers, but have not been studied in a dedicated fashion.[26,44]

As is the case with rehospitalizations after inpatient discharge,[45] ED recidivism is frequent, costly, and frustrating for patients and providers alike, and may be an actionable area for improvement. National efforts focusing on hospital readmissions such as those by the Centers for Medicare & Medicaid Services have “heavily invested in policies, incentives, technical assistance, multi-stakeholder engagements, and new payment models to mobilize providers to improve transitions in care.”[46] Only recently have return visits of recently hospitalized patients to the acute care setting through ED visits or observation stays garnered attention.[46] It is not known whether revisits by patients discharged from the ED share common drivers with revisits to the ED following recent hospitalization, although this seems likely. We found that patients with inadequate health literacy had higher observed utilization of the ED, and that the number of unique patients making return visits was higher among those with low health literacy than with adequate health literacy within 14 days.

Although few interventions have been demonstrated to show improvement in mitigating the negative effects of low health literacy, the Institute of Medicine's recent report on health literate organizations makes a number of recommendations that might be applicable in an ED setting.[47] These include integrating health literacy into patient safety and quality improvement efforts, addressing health literacy in high-risk situations such as care transitions and communication about medications, and using health literacy strategies in interpersonal communications and confirming understanding at all points of contact. These reflect areas in need of testing in the setting, with only limited data evaluating their effectiveness. Other areas for future work include determining whether certain diagnoses predominate among patients with limited health literacy making return visits, and whether among certain common diagnoses or reasons for visit to the ED, there tends to be a higher proportion of patients with limited health literacy. This might help tailor interventions that focus on higher risk groups.

LIMITATIONS

This was a retrospective review of usage data and is subject to limitations inherent to this design. This study used convenience sampling, which has the potential for selection bias and spectrum bias. Though imperfect, convenience sampling has been used for nearly all ED-based studies of health literacy. Ours is the only study that compares enrolled and declining patients along with the general ED population, demonstrating lack of differences among these populations in terms of the basic demographics allowed by the institutional review board to be recorded for patients who declined to participate (age, race, sex). This was a single-center study, which presents limitations to generalizability. We were able to detect return visits to any of the 13 EDs within our health system, improving the accuracy and reliability of this data. However, the total sample of patients in the study is small relative to the number of ED visits, which could affect representativeness of the sample. In addition, patients could have made visits outside our health system that we would not detect here. If this were done systematically by patients in one group, this could affect this study's findings by reducing the difference observed between these cohorts. Similarly, ED visit rate can be affected by death or admission. Although we did not explore information on mortality or admission rates for patients in the study, we do not have any reason to expect that these would be different for one group over the other in a manner that would change the study's findings. Confounding is one of the major limitations of observational studies, and although controlling for confounding factors can reduce the bias of estimates in regression models, there is always the possibility for unknown or unmeasured factors that are not included in the models. Although we attempted to collect data on common variables that might affect return rate, the list is clearly not exhaustive, and we may have omitted important factors. We used the SCS to help adjust for the burden of comorbidities among our study population, which might affect ED utilization and return visits. Other comorbidity scores such as the Charlson or Elixhauer indices are more widely used, and have been applied to evaluations of health service utilization, including at least one study predicting admission among patients returning within 3 days.[48] However, these indices were similarly derived among non-ED populations (hospitalized patients) for the evaluation of different outcomes than those for which they are often utilized, and themselves have recognized limitations.[49,50] Because our

data collection for utilization and recidivism covered a 2-year period, it is possible that some patient factors, such as home ownership, insurance status, and whether the patient has a PCP could change over this time period. We have no reason to think this would be unequally distributed between groups.

CONCLUSIONS

In this single-center study, we observed higher utilization of the ED by patients with inadequate health literacy when compared to those with adequate health literacy. Patients with inadequate health literacy made a higher number of return ED visits at 14 days, but not at 3 or 7 days.

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Table 1

Patient Characteristics

Variable	n	%
S-TOFHLA (score) (n=431)		
Inadequate health literacy (0–16)	57	13.23
Marginal health literacy (17–22)	45	10.44
Adequate health literacy (23–36)	329	76.33
Sex (n=430)		
Female	240	55.81
Male	190	44.19
Race (n=428)		
Non-Hispanic black	289	67.52
Non-Hispanic white	133	31.07
Other	6	1.40
Property owner (n=431)		
Yes	111	25.75
No	320	74.25
Personal doctor (n=431)		
Yes	264	61.25
No	167	38.75
Insurance (n=431)		
Private	146	33.87
Medicaid or Medicare	159	36.89
Self-pay	115	26.68
Other	11	2.55
Simplified Comorbidity Score (n=431)		
0–7	185	42.92
8–9	20	4.64
10–11	108	25.06
≥12	118	27.38
Educational attainment (n=431)		
Less than high school	77	17.87
High school	215	49.88
Some college or more	139	32.25

	Mean	Median	SD	IQR
Age, years (n=431)	45.31	47	15.78	33–57
Number of medications (n=414)	3.36	2	4.24	0–5

N = 431

S-TOFHLA = Short Test of Functional Health Literacy;

Table 2

Negative binomial model evaluating health literacy level and ED utilization.

Variable	Estimate	Incident Rate Ratio (95% CI)	p-value
Intercept	0.66		0.03
Health literacy (S-TOFHLA)*			
Marginal (score 17–22)	−0.25	0.77 (0.48–1.25)	0.30
Inadequate (score 0–16)	0.49	1.64 (1.04–2.59)	0.03
Race (ref: non-white)			
White	−0.59	0.55 (0.38–0.80)	0.002
Insurance (ref: private)			
Medicaid	0.53	1.69 (1.07–2.68)	0.02
Medicare	0.86	2.36 (1.47–3.80)	0.0004
Self-Pay	−0.26	0.77 (0.49–1.21)	0.26
Other	0.46	1.59 (0.63–4.02)	0.33
Simple Comorbidity Score (ref: score 0–7)			
8–9	0.12	1.13 (0.55–2.33)	0.74
10–11	0.32	1.37 (0.95–1.99)	0.09
≥12	0.45	1.56 (1.08–1.98)	0.02
Personal doctor (ref: no)			
Yes	0.35	1.41 (1.01–1.98)	0.04
Property owner (ref: no)			
Yes	−0.45	0.64 (0.42–0.98)	0.04
Number of medications	0.06	1.06 (1.02–1.12)	0.01
Age in years	−0.02	0.98 (0.97–0.99)	0.004

S-TOFHLA = Short Test of Functional Health Literacy;

*Reference is Adequate Functional health literacy (score 23–36)