

Low Health Literacy Is Associated with Increased Transitional Care Needs in Hospitalized Patients

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BACKGROUND: In discharge planning, a patient needs assessment helps to identify risk factors that should be addressed to promote a safe and effective transition in care. Low health literacy is associated with worse postdischarge outcomes, but little research has examined its relation to other addressable risk factors.

OBJECTIVE: To examine the association of health literacy with the number and type of transitional care needs (TCN) among patients being discharged to home.

DESIGN, SETTING, PARTICIPANTS: A cross-sectional analysis of patients admitted to an academic medical center.

MEASUREMENTS: Nurses administered the Brief Health Literacy Screen and documented TCNs along 10 domains: caregiver support, transportation, healthcare utilization, high-risk medical comorbidities, medication management, medical devices, functional status, mental health comorbidities, communication, and financial resources.

RESULTS: Among the 384 patients analyzed, 113 (29%) had inadequate health literacy. Patients with inadequate health literacy had needs in more TCN domains (mean = 5.29 vs 4.36; $P < 0.001$). In unadjusted analysis, patients with inadequate health literacy were significantly more likely to have TCNs in 7 out of the 10 domains. In multivariate analyses, inadequate health literacy remained significantly associated with inadequate caregiver support (odds ratio [OR], 2.61; 95% confidence interval [CI], 1.37-4.99) and transportation barriers (OR, 1.69; 95% CI, 1.04-2.76).

CONCLUSIONS: Among hospitalized patients, inadequate health literacy is prevalent and independently associated with other needs that place patients at a higher risk of adverse outcomes, such as hospital readmission. Screening for inadequate health literacy and associated needs may enable hospitals to address these barriers and improve postdischarge outcomes. *Journal of Hospital Medicine* 2017;12: 918-924. Published online first September 20, 2017. © 2017 Society of Hospital Medicine

A special concern since the institution of hospital readmission penalties¹ is the transitions in care of a patient from one care setting to another, often at hospital discharge. Burke et al.² proposed a framework for an ideal transition in care (ITC) to study and improve transitions from the hospital to home. The features in the ITC were identified based upon their inclusion in the interventions that improved discharge outcomes.³⁻⁵ Inspired by the ITC and other patient risk tools,⁶ we identified 10 domains of transitional care needs ([TCN] specified below), which we define as patient-centered risk factors that should be addressed to foster a safe and effective transition in care.⁷

One particularly important risk factor in patient self-management at transition points is health literacy, a patient's ability to obtain, understand, and use basic health information and services. Low health literacy affects approximately 26% to 36% of adults in the United States.^{8,9} Health literacy is associated with many factors that may affect successful navigation of care transitions, including doctor-patient communication,^{10,11} understanding of the medication regimen,¹² and self-management.¹³⁻¹⁵ Research has also demonstrated an association between low health literacy and poor outcomes after hospital discharge, including medication errors,¹⁶ 30-day hospital readmission,¹⁷ and mortality.¹⁸ Transitional care initiatives have begun to incorporate health literacy into patient risk assessments⁶ and provide specific attention to low health literacy in interventions to reduce adverse drug events and readmission.^{4,19} Training programs for medical students and nurses advise teaching skills in health literacy as part of fostering effective transitions in care.^{20,21}

Although low health literacy is generally recognized as a barrier to patient education and self-management, little is known about whether patients with low health literacy

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are more likely to have other risk factors that could further increase their risk for poor transitions in care. A better understanding of associated risks would inform and improve patient care. We hypothesized that TCNs are more common among patients with low health literacy, as compared with those with adequate health literacy. We also aimed to describe the relationship between low health literacy and specific TCNs in order to guide clinical care and future interventions.

METHODS

Setting

The present study is a cross-sectional analysis of data from a quality improvement (QI) intervention that was performed at Vanderbilt University Medical Center, a tertiary care facility in Nashville, Tennessee. The QI intervention, My Health Team (MHT), was funded by the Centers for Medicare and Medicaid Services Innovation Award program. The overall MHT program included outpatient care coordination for chronic disease management as well as a transitional care program that was designed to reduce hospital readmission. The latter included an inpatient needs assessment (which provided data for the present analysis), inpatient intervention, and postdischarge phone follow-up. The MHT initiative was reviewed by the institutional review board (IRB), which deemed it a QI program and granted a waiver of informed consent. The present secondary data analysis was reviewed and approved by the IRB.

Sample

Patients were identified for inclusion in the MHT transitions of care program if the presenting problem for hospital admission was pneumonia, chronic obstructive pulmonary disease (COPD) exacerbation, or decompensated heart failure, as determined by the review of clinical documentation by nurse transition care coordinators (TCCs). Adults over the age of 18 years were eligible, though priority was given to patients aged 65 years or older. This study includes the first inpatient encounter between June 2013 and December 31, 2014, for patients having a completed needs assessment and documentation of health literacy data in the medical record.

Data Collection

TCN assessment was developed from published patient risk tools and the ITC framework.^{2,6,22} The assessment has 10 domains composed of 49 individual items as follows: (1) caregiver support (caregiver support not sufficient for patient needs), (2) transportation (relies on public or others for transportation and misses medical care because of transportation), (3) health care utilization (no primary care physician, unplanned hospitalization in the last year, emergency department [ED] visit in the last 6 months, or home health services in the last 60 days), (4) high-risk medical comorbidities (malnutrition or body mass index <18.5, renal failure, chronic pain, diabetes, heart failure, COPD, or stroke), (5) medication management provider or caregiver

concern (cannot provide medication list, >10 preadmission medications, high-risk medications [eg, insulin, warfarin], poor medication understanding, or adherence issue identified), (6) medical devices (vascular access, urinary catheter, wounds, or home supplemental oxygen), (7) functional status (weakness of extremities, limited extremity range of motion, difficulty with mobility, falls at home, or activities of daily living challenges), (8) mental health comorbidities (over the past month has felt down, depressed, or hopeless or over the past month has felt little interest or pleasure in doing things, high-risk alcohol use, or high-risk substance use), (9) communication (limited English proficiency or at risk for limited health literacy), and (10) financial resources (no health insurance, skips or rations medicines because of cost, misses medical care because of cost, or misses medical care because of job).

The 49 items of the TCN assessment were documented as being present or absent by nurse TCCs at the time patients were enrolled in the transitional care program, based on patient and family interview and chart review, and the items were later extracted for analysis. Patients were determined to have a domain-level need if they reported a need on any individual item within that domain, resulting in a binary score (any need present, absent) for each of the 10 TCN domains.

Health literacy was assessed by using the Brief Health Literacy Screen (BHLS), which is administered routinely by nurses at hospital intake and documented in the medical record, with completion rates of approximately 90%.²³ The BHLS is a 3-question subjective health literacy assessment (scoring range 3-15) that has been validated against longer objective measures²⁴ and shown to predict disease control and mortality.^{18,25} To improve the stability of scores (for patients who completed the BHLS more than once because of repeat hospitalizations) and to reduce missing values, we calculated the patient's mean BHLS score for assessments obtained between January 1, 2013, and December 31, 2014. Patients were then categorized as having inadequate health literacy (BHLS \leq 9) or adequate health literacy (BHLS > 9).^{18,25} Demographic information was extracted from patient records and included age, sex (male/female), marital status (married/without a partner), race (white/nonwhite), and years of education. Income level and primary language were not available for analysis.

Statistical Analysis

Patient characteristics and TCNs were summarized by using the frequency and percentages for categorical variables and the mean and standard deviation (SD) for continuous variables. We compared patient characteristics (age, sex, marital status, race, and education) between health literacy groups (inadequate vs adequate) by using χ^2 or analysis of variance as appropriate. We assessed Pearson correlations among the 10 TCN domains, and we examined differences in reported needs for each of 10 TCN domains by the level of health literacy by using the χ^2 test. Because the TCN domain of com-

TABLE 1. Patient Characteristics Overall and by Health Literacy Level

Characteristic	Overall (N=384)	Inadequate Health Literacy (N=113)	Adequate Health Literacy (N=271)	P Value
Age ^a	66.9 (13.0)	68.6 (13.5)	66.1 (12.7)	.081
Sex				.431
Female	209 (54.4)	58 (51.3)	151 (55.7)	
Male	175 (45.6)	55 (48.7)	120 (44.2)	
Marital status				.031
Married	172 (44.8)	41 (36.6)	131 (48.7)	
Without a partner	209 (54.4)	71 (63.4)	138 (51.3)	
Race				.164
White	291 (75.8)	80 (72.7)	211 (79.3)	
Black	85 (22.1)	30 (27.2)	55 (20.7)	
Education, y ^a	12.6 (2.9)	11.2 (2.9)	13.2 (2.7)	<.001
Health literacy				–
Adequate	271 (70.6)	–	–	
Inadequate	113 (29.4)	–	–	

^aValues represent mean (standard deviation).

NOTE: values represent N (valid %). Missing or unknown: marital status (N=3), race (N=8), and education (N=6).

munication included low health literacy as one of its items, we excluded this domain from subsequent analyses. We then compared differences in the number of TCNs documented (scoring range 0-9) by using an independent samples Student t test.

Multivariate logistic regression models were then constructed to examine the independent association of inadequate health literacy with 8 TCN domains while controlling for age, sex, marital status, race, and education. Patients with incomplete demographic data were excluded from these models. Additionally, these analyses excluded 2 TCN domains: the communication domain for reasons noted above and the high-risk medical comorbidity domain because it ended up being positive in 98.4% of patients. Statistical significance was set at an alpha of 0.05. All analyses were performed by using SPSS Statistics for Mac, version 23.0 (IBM Corp., Armonk, New York)

RESULTS

A total of 403 unique patients received the needs assessment, and 384 (95.3%) patients had health literacy data available (Table 1). The number of patients with missing or unknown values were 3 for marital status, 8 for race, and 6 for education. The patients had an average age of 66.9 years (SD = 13.0 years). Among the sample, 209 (54%) were female, 172 (45%) were married, and 291 (75.8%) were white. The average years of education was 12.6 (SD = 2.9 years), and 113 (29%) had inadequate health literacy. Patients with inadequate health literacy completed fewer years of schooling (11.2 vs 13.2; $P < 0.001$) and were less likely to be married (37% vs 49%; $P = 0.031$). There was no significant difference in age, sex, or race by level of health literacy.

Patients overall had a mean of 4.6 (SD = 1.8) TCN domains with any need reported. The most common domains

were high-risk comorbidity (98%), medication management (76%), and healthcare utilization (76%; Table 2). For most domains, the presence of needs was significantly correlated with the presence of needs in multiple other domains (Table 3). Patients with inadequate health literacy had needs in a greater number of TCN domains (mean = 5.29 vs 4.36; $P < 0.001$).

In unadjusted analysis, patients with inadequate health literacy were significantly more likely to have TCNs in 7 out of the 10 domains (Table 2). These concerns related to caregiver support, transportation, healthcare utilization, presence of a medical device, functional status, mental health comorbidities, and communication. The inadequate and adequate health literacy groups were similar in needs with respect to high-risk comorbidity and finance and borderline nonsignificant for medication management.

In multivariate analyses, 371 patients had complete demographic data and were thus included. After adjustment for age, sex, marital status, race, and education, inadequate health literacy remained significantly associated with reported needs in 2 transitional care domains: inadequate caregiver support (odds ratio [OR], 2.61; 95% confidence interval [CI], 1.37-5.00) and transportation barriers (OR, 1.69; 95% CI, 1.04-2.76; Figure). Other domains approached statistical significance: medical devices (OR, 1.56; 95% CI, 0.96-2.54), functional status (OR, 1.67; 95% CI, 1.00-2.74), and mental health comorbidities (OR, 1.60; 95% CI, 0.98-2.62).

Older age was independently associated with more needs related to medical devices (OR, 1.02; 95% CI, 1.00-1.04), functional status (OR, 1.03; 95% CI, 1.02-1.05), and fewer financial needs (OR, 0.93; 95% CI, 0.91-0.96). Being married or living with a partner was associated with fewer needs related to caregiver support (OR, 0.37; 95% CI, 0.19-0.75)

TABLE 2. Transitional Care Needs Overall and by Health Literacy Level

Domain	Needs Assessment Domain	Total Patients with Need (N=384)	Inadequate Health Literacy (N=113)	Adequate Health Literacy (N=271)	P Value
1	Caregiver support	53 (13.8)	26 (23.0)	27 (10.0)	.001
2	Transportation	187 (48.7)	70 (61.9)	117 (43.2)	.001
3	Healthcare utilization	294 (76.6)	96 (85.0)	198 (73.1)	.012
4	High-risk comorbidity	378 (98.4)	110 (97.3)	268 (98.9)	.265
5	Medication management	293 (76.3)	93 (82.3)	200 (73.8)	.074
6	Medical device	178 (46.4)	63 (55.8)	115 (42.4)	.017
7	Functional status	211 (54.9)	73 (64.6)	138 (50.9)	.014
8	Mental health comorbidity	137 (35.7)	50 (44.2)	87 (32.1)	.024
9	Communication	83 (21.6)	46 (40.7)	37 (13.7)	<.001
10	Finance	49 (12.8)	17 (15.0)	32 (11.8)	.386

NOTE: Values represent N (%). Patients were considered to have a need in a particular domain if they had a need on any item belonging to that domain (see Box).

TABLE 3. Correlation Among Transitional Care Needs

Domain	Caregiver Support	Transportation	Healthcare Utilization	High-Risk Comorbidity	Medication Management	Medical Device	Functional Status	Mental Health Comorbidity	Communication	Finance
Caregiver support	1									
Transportation	.245 ^a	1								
Healthcare utilization	.132 ^a	.158 ^a	1							
High-risk comorbidity	-.010	.081	-.020	1						
Medication management	.170 ^a	.163 ^a	.096	.078	1					
Medical device	.097	.118 ^b	.120 ^b	.075	.051	1				
Functional status	.226 ^a	.296 ^a	.129 ^b	.013	.111 ^b	.170 ^a	1			
Mental health comorbidity	.143 ^a	.188 ^a	.091	-.125 ^b	.121 ^b	.114 ^b	.150 ^a	1		
Communication	.303 ^a	.298 ^a	.156 ^a	.015	.129 ^b	.019	.119 ^b	.032	1	
Finance	.164 ^a	.096	.119 ^a	-.078	-.007	-.058	-.015	.122 ^b	.140 ^a	1

^aP < .01.

^bP < .05.

and more device-related needs (OR, 1.60; 95% CI, 1.03-2.49). A higher level of education was associated with fewer transportation needs (OR, 0.89; 95% CI, 0.82-0.97).

DISCUSSION

A structured patient risk factor assessment derived from literature was used to record TCNs in preparation for hospital discharge. On average, patients had needs in about half of the TCN domains (4.6 of 9). The most common areas identified were related to the presence of high-risk comorbidities (98.4%), frequent or prior healthcare utilization (76.6%), medication management (76.3%), functional

status (54.9%), and transportation (48.7%). Many of the TCNs were significantly correlated with one another. The prevalence of these needs highlights the importance of using a structured assessment to identify patient concerns so that they may be addressed through discharge planning and follow-up. In addition, using a standardized TCN instrument based on a framework for ITC promotes further research in understanding patient needs and in developing personalized interventions to address them.

As hypothesized, we found that TCNs were more common in patients with inadequate health literacy. After adjustment for demographic factors, inadequate health literacy was sig-

nificantly associated with transportation barriers and inadequate caregiver support. Analyses also suggested a relationship with needs related to medical devices, functional status, and mental health comorbidities. A review of the literature substantiates a link between inadequate health literacy and these needs and also suggests solutions to address these barriers.

The association with inadequate caregiver support is concerning because there is often a high degree of reliance on caregivers at transitions in care.³⁻⁵ Caregivers are routinely called upon to provide assistance with activities that may be difficult for patients with low health literacy, including medication adherence, provider communication, and self-care activities.^{26,27} Our finding that patients with inadequate health literacy are more likely to have inadequate caregiver support indicates additional vulnerability. This may be because of the absence of a caregiver, or in many cases, the presence of a caregiver who is underprepared to assist with care. Prior research has shown that when caregivers are present, up to 33% have low health literacy, even when they are paid nonfamilial caregivers.^{26,28} Other studies have noted the inadequacy of information and patient training for caregivers.^{29,30} Transitional care programs to improve caregiver understanding have been developed³¹ and have been demonstrated to lower rehospitalization and ED visits.³²

Patients with inadequate health literacy were also more likely to have transportation barriers. Lack of transportation has been recorded as a factor in early hospital readmission in patients with chronic disease,³³ and it has been shown to have a negative effect on a variety of health outcomes.³⁴ A likely link between readmission and lack of transportation is poor follow-up care. Wheeler et al.³⁵ found that 59% of patients expected difficulty keeping postdischarge appointments because of transportation needs. Instead of expecting patients to navigate their own transportation, the Agency for Healthcare Research and Quality recommends identifying community resources for patients with low health literacy.³⁶

In this sample, inadequate health literacy also had near significant associations with TCNs in the use of medical devices, lower functional status, and mental health comorbidities. The use of a medical device, such as home oxygen, is a risk factor for readmission,³⁷ and early reports suggest that interventions, including education related to home oxygen use, can dramatically reduce these readmissions.³⁸ Lower functional capacity and faster functional decline are associated with inadequate health literacy,³⁹ which may have to do with the inability to appropriately utilize health resources.⁴⁰ If so, structured dis-

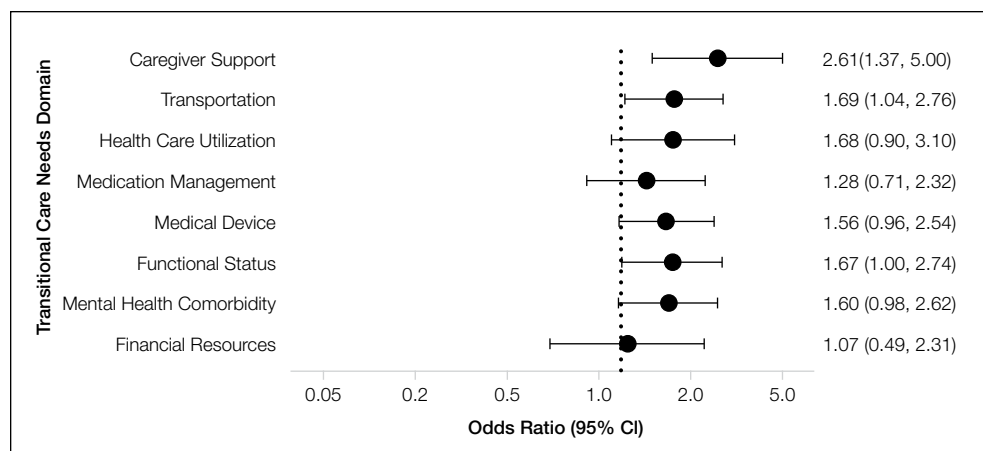


FIG. Odds of transitional care need increase for patients with inadequate health versus adequate health literacy.

NOTE: Abbreviations: CI, confidence interval; HL, health literacy; OR, odds ratio.

charge planning could alleviate the known connection between functional impairment and hospital readmissions.⁴¹ A relationship between low health literacy and depression has been demonstrated repeatedly,⁴² with worsened symptoms in those with addiction.⁴³ As has been shown in other domains where health literacy is a factor, literacy-focused interventions provide greater benefits to these depressed patients.⁴⁴

The TCN assessment worked well overall, but certain domains proved less valuable and could be removed in the future. First, it was not useful to separately identify communication barriers, because doing so did not add to information beyond the measurement of health literacy. Second, high-risk comorbidities were ubiquitous within the sample and therefore unhelpful for group comparisons. In hindsight, this is unsurprising because the sample was comprised primarily of elderly patients admitted to medical services. Still, in a younger population or a surgical setting, identifying patients with high-risk medical comorbidities may be more useful.

We acknowledge several limitations of this study. First, the study was performed at a single center, and the TCN assessments were conducted by a small number of registered nurses who received training. Therefore, the results may not generalize to the profile of patient needs at other settings, and the instrument may perform differently when scaled across an organization. Second, the needs assessment was developed for this QI initiative and did not undergo formal validation, although it was developed from published frameworks and similar assessments. Third, for the measure of health literacy, we relied on data collected by nurses as part of their normal workflow. As is often the case with data collected during routine care, the scores are imperfect,⁴⁵ but they have proven to be a valuable and valid indicator of health literacy in our previous research.^{18,24,25,46} Fourth, we chose to declare a domain as positive if any item in that domain was positive and to perform a domain-level analysis (for greater clarity). We did not take into account the variable number of items within each domain or attempt to grade their severity, as this would be a subjective exercise and impractical in

the discharge planning process. Finally, we were unable to address associations among socioeconomic status,⁴⁷ primary language,⁴⁸ and health literacy, because relevant data were not available for this analysis.

CONCLUSION

In this sample of hospitalized patients who were administered a structured needs assessment, patients commonly had needs that placed them at a higher risk of adverse outcomes, such as hospital readmission. Patients with low health literacy had more TCNs that extended beyond the areas that we normally associate with low health literacy, namely patient education and self-management. Healthcare professionals should be aware of the greater likelihood of transportation barriers and inadequate caregiver support among patients with low health literacy. Screening for health literacy and TCN at admission or as part of the discharge planning process will elevate such risks, better positioning clinicians and

hospitals to address them as a part of the efforts to ensure a quality transition of care.

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