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Screening Hospitalized Patients for Low Health Literacy— Beyond the REALM of Possibility?

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Abstract

As patient-centered education efforts increase, assessing health literacy (HL) becomes more salient. The verbal BHLS may have clinical and feasibility advantages over written tools, including the REALM-R and S-TOFHLA, however the BHLS' utility among inpatients remains unresolved. Hospitalized adults were enrolled; HL was assessed using three tools. Categorical comparisons used Chi-square; AUROC curve was calculated (reference: REALM-R). The prevalence of low HL among participants (n=260) was higher for the BHLS than S-TOFHLA (29% vs. 17%, $p<0.001$) and higher for the REALM-R than both the BHLS (44% vs. 29%, $p=0.004$) and S-TOFHLA (44% vs. 17%, $p<0.001$). The AUROCs were 0.58 for BHLS and 0.66 for S-TOFHLA. The different prevalence of low HL among the participants based on each tool likely reflects the complexity of measuring HL and differing domains captured by each tool. The BHLS can be considered a viable inpatient HL screening tool, given its increased feasibility and verbal administration.

Keywords

Health Literacy; Hospitalized Patients; Self-management

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Introduction

Rapidly assessing health literacy (HL) has become increasingly important in clinical settings to identify patients at risk for negative outcomes, including preventable hospitalizations, poor medication adherence, and misunderstanding discharge instructions (Lindquist et al., 2011). Previous research has linked low HL with poor self-rated health, self-efficacy, and decreased use of preventative services (Berkman et al., 2011; Sarkar, Fisher, & Schillinger, 2006). A “universal precautions” approach of presenting health information to everyone in a clear, easily understood manner (DeWalt et al., 2011; Koh, Brach, Harris, & Parchman, 2013) is recommended for all patients. While we agree this is an important and necessary step for all patients, it may be necessary to identify patients at highest risk or who need additional resources. Further, research has shown that physicians who are made aware of their patient’s low HL status are more likely to use communication-enhancing management strategies, like reviewing medications, using diagrams, or spending time on education during the office visit (Seligman et al., 2005).

Hospitalization represents a crucial care transition point for patients with exacerbations of chronic disease, in which patient education can aid in improving disease management and reducing negative health outcomes after discharge, such as readmissions and discharge medication errors (Hume et al., 2012). Resources may be limited for in-hospital patient education, so triaging by HL level may be necessary for resource-optimization (Koh et al., 2013). Therefore, it is critical to have feasible, clinically oriented methods for assessing hospitalized patients’ HL to triage and provide the most appropriate care and resources needed.

There are, however, several barriers to widespread HL screening among hospitalized patients. Nursing staff, for instance, have a myriad of documentation to complete in addition to their patient-care duties. The ideal screening tool, therefore, should be brief, simple to score, and have easily reportable results that can be incorporated into the electronic health record (EHR). Further, since adequate vision and literacy are known barriers to administering screening tools to hospitalized patients, an ideal HL screening tool would be verbally administered to avoid problems with seeing or processing written materials (Press et al., 2015; Press, Shapiro, Mayo, Meltzer, & Arora, 2013). Another barrier to wide-spread screening has been identifying an effective screening tool. Two of the most common written HL assessments, the Short Test of Functional Health Literacy in Adults (S-TOHFLA) and Rapid Estimate of Adult Literacy in Medicine—Revised (REALM-R), have been validated in multiple settings including the hospital setting (Baker et al., 1999; Bass, Wilson, & Griffith, 2003). However, they are more cumbersome and/or less likely to be used widely in the clinical setting because of their lengthy administration time (S-TOFHLA), need for a trained administrator since both tools are graded and timed (both), and their ‘test-like’ nature (both). In part to address these barriers, Chew et al. (2008) have developed a screening tool that is intended for feasible clinical use, called the Brief Health Literacy Screen (BHLS).

The BHLS has largely been validated in research and outpatient settings, as a verbally administered 3-item tool (Chew et al., 2008). We have previously examined its utility in the inpatient setting compared to the REALM-R and demonstrated that the two tools did not

find a similar prevalence of low HL among our inpatient study population (Press et al., 2013). More recently, work by Wallston et al. (2013) compared the BHLS to the S-TOFHLA and found promising results, both with regards to feasibility and validation of the tool for clinical use in both outpatient and inpatient settings. Therefore, the BHLS has been compared in two separate studies against two of the most common written HL assessment tools, but with varying findings. Since the BHLS is rapidly being implemented in hospital systems as a widespread HL screening tool, but limited and conflicting studies exist, our objective was to compare the prevalence of low HL measured by the verbally administered BHLS to both tools administered in writing, the REALM-R and S-TOFHLA, to investigate further the utility of the BHLS in the inpatient setting.

Methods

Study Design

We conducted a prospective study *examining three instruments (one verbally administered and two administered in writing—described as “verbal” and “written” tools, respectively)* used to evaluate the HL of hospitalized patients. Trained research assistants approached, consented, and enrolled adult, cognitively intact, English speaking, general medicine inpatients as part of the Hospitalist Project, an ongoing study of resource-allocation and quality-of-care (Meltzer et al., 2002). The University of Chicago Institutional Review Board approved the research protocol (IRB #9967).

Data Collection

Research assistants (RAs) collected demographic information and administered the BHLS. A second masked RA administered the written S-TOFHLA and REALM-R tools for participants who had 20/50 or better visual acuity in at least one eye.

Tools

The BHLS assesses participants' self-reported HL. Three questions are scored from 0–4. Low HL is identified by a score of 2 on at least one of these questions. The three questions are: 1) “How often do you have problems learning about your medical condition because of difficulty understanding written information?” 2) “How confident are you filling out medical forms by yourself?” and 3) “How often do you have someone help you read hospital materials?”

The S-TOFHLA consists a 36-item multiple choice assessment with 7 minutes to complete; scores 22/36 were identified as having less-than-adequate HL.

The REALM-R is a written-administered tool of 8 medical terms; participants have 5 seconds to correctly pronounce each word; participants who scored 6/8 words correct are classified as having low HL.

Data Analysis

Descriptive statistics were used to determine means and proportions. Chi-squared tests were used for categorical comparisons of the tools. McNemar's test was used to compare the

BHLS to the reference test (REALM-R). The area under the Receiver Operating Characteristic (AUROC) curve was calculated to determine the discrimination—ability to correctly classify those with and without low HL—of each test. For each test, participants were dichotomized as having either low or high HL based on the tools' published definitions (Baker et al., 1999; Bass et al., 2003; Chew et al., 2008).

For our primary outcome, we calculated the AUROC for the BHLS using the REALM-R as the reference tool to confirm our previous findings. Secondary analyses included calculating the AUROC for the BHLS using the S-TOFHLA as the reference tool and assessing concurrent validity of the tools. To assess the concurrent validity of the tools, we used the raw scores to calculate Spearman's rank correlation coefficients to determine the strength of correlation between two ranked variables (standard acceptable r_s is 0.7). All computations were made using Stata 13 (StataCorp, College Station, TX).

Results

Participant Enrollment

From April 30, 2013 through February 16, 2014, 3111 participants were screened, of whom 1310 were discharged prior to approach, 1422 were ineligible, and 119 chose not to participate. Ultimately, 260 participants were enrolled in this study and completed all three HL assessments.

Participant Characteristics

Over half of the participants were female (58%, 150/260) and nearly three-quarters were African-American (72%, 188/260). The mean age was 43 years.. About half of participants (43.4%, 113/260) had either a high school education or less, 32.3% (84/260) reported some college, and 24.3% (63/260) of subjects had a Bachelor's degree or higher.

Health Literacy Assessments

Our primary outcome was to determine if the BHLS identified a similar prevalence of low HL as the S-TOFHLA and REALM-R. Our results demonstrated that the BHLS identified a higher prevalence of low HL than the S-TOFHLA (29.2% vs. 17.3%, respectively, $p<0.001$) (Table 1). Additionally, we found that the REALM-R identified a significantly higher prevalence of low HL versus the S-TOFHLA (44.2% vs. 17.3%, respectively, $p<0.001$) and versus the BHLS (44.2% and 29.2%, respectively, $p=0.004$).

When comparing the BHLS to the REALM-R, we found that the BHLS had a sensitivity of 38% and a specificity of 78%, with a positive predictive value (PPV) of 58% and a negative predictive value (NPV) of 61%. When we compared the S-TOFHLA to the REALM-R, we found that the S-TOFHLA had a sensitivity of 35% and specificity of 97%, with a PPV of 89% and a NPV of 65%. We also compared the BHLS to the S-TOFHLA and found the BHLS had a sensitivity of 53%, a specificity of 76%, a PPV of 32%, and a NPV of 89%.

When evaluating the discrimination of the BHLS versus the written tools, the BHLS AUROC was 0.58 and the S-TOFHLA AUROC was 0.66. Additionally, using the S-TOFHLA as a reference tool we found an AUROC of 0.65. (Figure 1) for BHLS.

When assessing the concurrent validity of the tools, the BHLS versus REALM-R, showed a weak positive correlation ($r_s=0.17$, $p=0.004$) (Table 1), S-TOFHLA versus REALM-R demonstrated a moderate positive correlation ($r_s=0.41$, $p<0.001$), and BHLS versus S-TOFHLA demonstrated a weak positive correlation ($r_s=0.24$, $p<0.001$).

Discussion

Our study compared the verbal, clinically feasible HL assessment tool, the BHLS, versus two of the most common written HL tools, and found discordance in our hospitalized population among all three tools with respect to identifying the prevalence of low HL. The question remains, however, whether this discordance is related to the utility of these tools in the clinical setting. First, the tools had low sensitivity ($<40\%$), but high specificity ($>75\%$), indicating that if patients are identified as being at risk for low HL with any of these tools, clinicians should direct appropriate resources. Second, it is important to consider that each tool measures different aspects of HL. The S-TOFHLA measures HL-related reading comprehension (Baker et al., 1999), while the REALM-R measures medical vocabulary fluency (Bass et al., 2003). The BHLS is a self-reported assessment that measures patients' self-perceived HL and ability to navigate the health system. This may not correlate with actual HL, which is more likely measured by the S-TOFHLA; therefore the higher prevalence of low HL on BHLS than the S-TOFHLA, may represent this discordance. As self-care is often particularly complex for hospitalized patients, the BHLS' self-report nature may be particularly susceptible to the dynamic nature of a patients' health status. Since self-care has been linked to health outcomes, the BHLS may be particularly well-suited to assess HL among hospitalized patients.

Self-perception is important as it is linked to self-efficacy and HL, along with important disparities in outcomes, such as increased mortality rates for seniors, poorer overall health, and reduced ability to interpret medication labels, take medications properly, and interpret health messages (Berkman et al., 2011). The utility of widespread screening for low HL has been the subject of recent debate. However, unlike biomedical diseases where widespread screening is not recommended unless there is effective treatment for the disease, the authors believe that screening is warranted because HL can be fluid and potentially changes over time depending on physical health and environment (Von Wagner et al., 2009). Because of the link between low HL and poor outcomes, it is useful to screen for low HL despite the discrepancies between the HL screening tools, and the self-report nature of BHLS. Additionally, because adequate vision is a known barrier in the hospital setting and is necessary for completion of the S-TOFHLA and REALM-R, a verbal tool would allow for more widespread HL screening. Taking all things into account, the BHLS is a tool that is that can be feasibly integrated into clinical care for rapid, widespread implementation of inpatient HL screening. The BHLS may have increased sensitivity to higher intensity clinical settings such as hospitalization. Future work can evaluate the BHLS compared to other clinically focused tools.

Recognizing that HL is a complex construct, and no one tool identifies HL risk perfectly, the BHLS, to date is the most clinically feasible screening tool for health care providers to identify hospitalized patients at high risk for low HL and implement interventions, when

appropriate. Our study, too, had limitations, particularly around issues of generalizability, due to implementation at a single study site among an urban, predominately African-American inpatient population. Another limitation that is important to note is that the interaction of low HL and vision may preclude some patients from engaging in this research study; however this is likely true across research studies and is exactly why further research into patient and research subject limitations of vision and HL are so critical to understand. Evaluating the tools to measure these qualities is just the first step.

In conclusion, without a gold standard tool to measure HL, identifying the ideal tool for the clinical setting remains elusive. For clinical feasibility, a tool that limits barriers, such as poor vision, is fast to complete, such as a 3-item verbal screen, and can be easily scaled through integration into an EHR, the BHLS is one of the leading contenders. Therefore, the balance of positive attributes of the BHLS in terms of its clinical feasibility, being able to overcome several of the challenges posed by written tools, and high specificity makes it one of the briefest and most feasible clinical screening tools available.

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Figure 1.

Area Under the Receiver Operating Characteristic Curve for BHLS and S-TOFHLA Compared to REALM-R

ROC: Receiver operating characteristic

BHLS: Brief Health Literacy Screen

S-TOFHLA: Short Test of Functional Health Literacy in Adults

REALM-R: Rapid Estimate of Adult Literacy in Medicine-Revised

Table 1

Health Literacy Tools (n=260)

Test	Prevalence of low HL [×]	Correlation [^]	p value	AUROC [#]
~ BHLS vs. ⁺ REALM-R	29 vs 44	0.17	0.004*	0.58
% S-TOFHLA vs. REALM-R	17 vs 44	0.41	<0.001*	0.66
BHLS vs. S-TOFHLA	29 vs 17	0.24	<0.001*	0.65

[×]Proportion[^]Spearman's rho[#]AUROC: Area Under Receiver Operating Characteristic

~BHLS: Brief Health Literacy Screen

%S-TOFHLA: Short Test of Functional Health Literacy in Adults

⁺REALM-R: Rapid Estimate of Adult Literacy in Medicine-Revised