

# Testing the BRIEF Health Literacy Screening Tool

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Due to the oppressive strains laid on the nation's health care system, efforts to prevent adverse outcomes related to patients' inadequate health literacy are warranted. By identifying patients' health literacy skills with this tool, these authors strive not only to prevent personal and system loss but also to provide patient-centered care.

Inadequate health literacy is a major problem in the United States. Patients' health literacy skills affect their ability to communicate with health care providers, adhere to health care regimens, access and navigate health care services, and manage health issues.<sup>1,2</sup> Yet the Institute of Medicine estimated in 2004 that nearly half of all American adults (about 90 million people) have difficulty understanding and acting upon health information.<sup>2</sup> Each year, inadequate health literacy results in approximately \$73 billion in unnecessary health care costs.<sup>3</sup>

In order to facilitate effective and timely interventions that can promote a high quality, cost-efficient health care experience, health care providers are in need of a brief, effective tool for detecting inadequate health literacy among their patients. At present, there are validated tools for assessing

health literacy, including the Short Test of Functional Health Literacy in Adults (STOFHLA)<sup>4</sup> and the Rapid Estimate of Adult Literacy (REALM).<sup>5</sup> Current tools, however, either take too long to administer or are potentially embarrassing to patients.<sup>6</sup>

Recent studies have attempted to create a brief and effective health literacy screening tool. Chew and colleagues developed 16 health literacy screening questions and administered them, along with the STOFHLA, to 332 participants.<sup>6</sup> They found that, as determined by the STOFHLA, three of the new questions were effective at detecting inadequate health literacy, that these three questions were weaker at detecting inadequate/marginal health literacy, and that no combination of the three questions was more effective at identifying inadequate health literacy than any of those individual questions.

Wallace and colleagues administered the same three questions, along with the REALM, to 305 participants who differed demographically from the participants in Chew and colleagues' study.<sup>7</sup> Their results indicated that, as determined by the REALM, one of the questions was accurate in detecting limited and limited or marginal health literacy and was more accurate than any combination of the three questions. Later, Baker asserted that the inconsistencies between Chew and colleagues'

study and Wallace and colleagues' study indicate a need for further research,<sup>8</sup> while Parker and Kindig called for more research on the measurement of both individual and population-level health literacy skills.<sup>9</sup>

With these issues in mind, we developed the Brief Health Literacy Screening Tool (known as the BRIEF) and conducted a study to determine its efficacy. The BRIEF consists of the three questions evaluated by Chew and colleagues and Wallace and colleagues, along with a fourth question that we developed. We investigated the tool's efficacy at detecting inadequate and inadequate/marginal health literacy in a VA ambulatory care setting by using the STOFHLA and the REALM as standards of actual health literacy. In this article, we present our findings and discuss how we have implemented the BRIEF within our own health care system.

## METHODS

Our study involved the administration of the BRIEF, the STOFHLA, the REALM, and a self-administered survey to a convenience sample of patients presenting for care in a VA ambulatory setting between March and August 2006. We employed an action research method, through which 21 trained, volunteer health care providers collected patient data on site in the clinical, ambulatory care setting. The data collectors were from eight rural

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**Table 1. Patients' general literacy skills according to level and score of the STOFHLA<sup>a</sup> and the REALM<sup>b</sup>**

Level	Score	General literacy skills
<b>STOFHLA</b>		
Inadequate	0–16	Able to perform uncomplicated tasks involving brief and uncomplicated texts and documents
Marginal	17–22	Able to locate information in text, make low-level inferences using printed materials, and integrate easily identifiable pieces of information
		Able to integrate information from relatively long or dense texts or documents, determine appropriate arithmetic operations based on information contained in the directive, and identify quantities needed to perform operation
Adequate	23–36	Demonstrates proficiencies associated with long and complex documents and text passages; able to determine and interpret qualitative and quantitative data needed to perform an operation
<b>REALM</b>		
Limited	0–44	Not able to read most low literacy health materials; will need repeated oral instructions; materials should be composed of illustrations or video tapes; will need low literacy materials; may not be able to read a prescription label
Marginal	45–60	Struggles with most patient education materials
Adequate	61–66	Able to read and comprehend most patient education materials

<sup>a</sup>STOFHLA = Short Test of Functional Health Literacy in Adults. <sup>b</sup>REALM = Rapid Estimate of Adult Literacy.

and nonrural VA ambulatory care clinics and hospitals in northern Florida and southern Georgia and included 17 nurses, the principal investigator, a nutritionist, a dental technician, and a nurse educator volunteer. Once patients agreed to participate in the study, their data were collected either by one of the provider data collectors in their ambulatory care setting or by the principal investigator in an examination room in the same setting. Inclusion criteria required the patients to assent to their participation verbally and in English. No incentives for participation were provided.

### The instruments

The BRIEF consists of the following questions: (1) How often do you have someone help you read hospital materials?"; (2) How confident are you filling out medical forms by

yourself?"; (3) "How often do you have problems learning about your medical condition because of difficulty understanding written information?"; and (4) "How often do you have a problem understanding what is told to you about your medical condition?" For the first, third, and fourth questions, response options are offered in the following five-point Likert scale: 1 = always, 2 = often, 3 = sometimes, 4 = occasionally, and 5 = never. For the second question, the following five-point Likert scale is offered: 1 = not at all, 2 = a little bit, 3 = somewhat, 4 = quite a bit, and 5 = extremely. The first three questions were evaluated in the studies by Chew and colleagues and Wallace and colleagues.<sup>6,7</sup> We added the fourth question to assess difficulties with auditory health information and, thus, increase the tool's validity.

The BRIEF can be administered and scored in less than two minutes. BRIEF scores range from 4 to 20. Based on the previous evaluations of the first three questions,<sup>6,7</sup> we set three criterion levels for BRIEF scores: inadequate (scores of 4 to 12), marginal (scores of 13 to 16), and adequate (scores of 17 to 20).

The STOFHLA and the REALM were used to test the BRIEF's efficacy (Table 1). The STOFHLA is a shortened version of the Test of Functional Health Literacy,<sup>10,11</sup> and it measures patients' ability to read and understand two passages. It includes 36 items, has a score range of 0 to 36, takes up to seven minutes to administer, and takes about two additional minutes to score. STOFHLA scores divide health literacy skills into three criterion levels: inadequate (0 to 16), marginal (17 to 22), and adequate (23 to 36).

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**Table 2. Demographic characteristics of the study participants (N = 378)**

Characteristic	Study population
Age in years	
Average (SD)	61.5 (11.9)
Range	23–89
Gender, no. (%)	
Male	356 (94.2)
Female	19 (5)
Not reported	3 (0.8)
Education level, no. (%)	
Elementary school (grades 1–5)	4 (1.1)
Junior high school (grades 6–8)	11 (2.9)
Some high school (grades 9–12)	56 (14.9)
High school/GED <sup>a</sup>	98 (25.9)
Some college	126 (33.3)
College degree	80 (21.2)
Trade school	1 (0.3)
Not reported	2 (0.5)
Ethnicity, no. (%)	
Black	69 (18.3)
White	278 (73.5)
Hispanic/Latino	12 (3.2)
Native American	12 (3.2)
Asian American	1 (0.3)
Other	3 (0.8)
Not reported	3 (0.8)

<sup>a</sup>GED = General Educational Development.

The REALM assesses health literacy by asking respondents to read a list of 66 words aloud. REALM scores range from 0 to 66 and are divided into three criterion levels: limited (0 to 44), marginal (45 to 60), and adequate (61 to 66). Although the REALM has been described as taking one to two minutes to administer,<sup>5</sup> the pace of its administration is set by respondents and, in our experience, can exceed two minutes considerably.

The self-administered survey consisted of 19 items. Seven items assessed demographic data: age, gender, marital status, race/ethnicity, language, home ownership, and education. One item assessed English

as a first language and another asked participants to rate their reading ability on a five-point Likert scale (1 = excellent and 5 = poor). Three items pertained to health status, assessing whether patients currently had high blood pressure or diabetes or had a history of stroke. The last eight items gathered miscellaneous data about access to health information resources.

### Data analysis

Data were managed and analyzed using the SPSS 12.0 (SPSS Inc, Chicago, IL) software package. The level of significance was set at a 95% level of confidence, with a *P* value of less than .05. Univariate statistical analy-

ses were conducted to provide preliminary statistical information and assess data patterns. A Pearson product moment correlation coefficient was calculated to determine the validity of the BRIEF in comparison to the REALM and the STOFHLA. A principal component analysis was conducted to determine if, in fact, the BRIEF measures one distinct construct—“health literacy.”

Our study utilized the measures of sensitivity—defined as the “proportion of patients who were positive for the test among all patients with the disease”<sup>12</sup>—as the primary indicator of accuracy of the BRIEF. Receiver operator characteristic (ROC) curves were calculated to plot sensitivity. Areas under the ROC curve (AU-ROCs) were calculated to test the efficacy of each of the BRIEF’s four items individually and the items grouped as the BRIEF, using the STOFHLA and the REALM as state variables or “true indicators” of health literacy skills. Again using the STOFHLA and the REALM as state variables, AUROC curves were calculated to determine the degree to which the BRIEF identifies respondents with inadequate health literacy skills and those with inadequate/marginal health literacy skills (a composite grouping of respondents with inadequate skills and those with marginal skills). An analysis of variance (ANOVA) also was conducted to test for group differences between the proposed BRIEF score levels to indicate optimal cut-off points for determining levels of health literacy.

### RESULTS

A total of 378 patients agreed to participate, giving the study a response rate of approximately 90%. Patients’ reasons for refusal were not assessed.

Of the participants, 94% were male and 74% were white (Table 2).

The mean (SD) age of the total study cohort was 61.5 (11.9) years; by ethnicity, it was 62.7 (11.4) years for whites, 56.7 (12.1) years for blacks, 61.9 (12.6) years for Hispanics/Latinos, and 68.6 (11.4) years for Native Americans. When asked to self-rate their reading ability, 85% of participants said it was “good” to “very good” and 15% said it was “fair” to “poor.” In addition, 97% of participants reported speaking English as their first language, 77% reported owning their home, 64% reported having high blood pressure, 35% reported having diabetes, and 11% reported having had at least one stroke.

### Health literacy

Of the participants, 20% showed inadequate health literacy skills on the BRIEF, 7% showed inadequate skills on the REALM, and 9% showed inadequate skills on the STOFHLA. Approximately 37% of the participants showed marginal skills on the BRIEF, 30% showed marginal skills on the REALM, and 8% showed marginal skills on the STOFHLA. Finally, 43% of the participants showed adequate skills on the BRIEF, 64% showed adequate skills on the REALM, and 83% showed adequate skills on the STOFHLA (Figure). The average (SD) scores for the three screening tools were as follows: BRIEF = 15.39 (3.67); REALM = 59.42 (8.96); and STOFHLA = 29.83 (8.03).

### BRIEF accuracy

Pearson correlation results were:  $r(378) = .40$  ( $P < .01$ ) for the BRIEF and the REALM;  $r(378) = .42$  ( $P < .01$ ) for the BRIEF and the STOFHLA; and  $r(378) = .61$  ( $P < .01$ ) for the REALM and the STOFHLA. Since a general rule of thumb for determining if there is a relationship between variables is a minimum correlation coefficient of .3,<sup>13</sup> compared to stan-

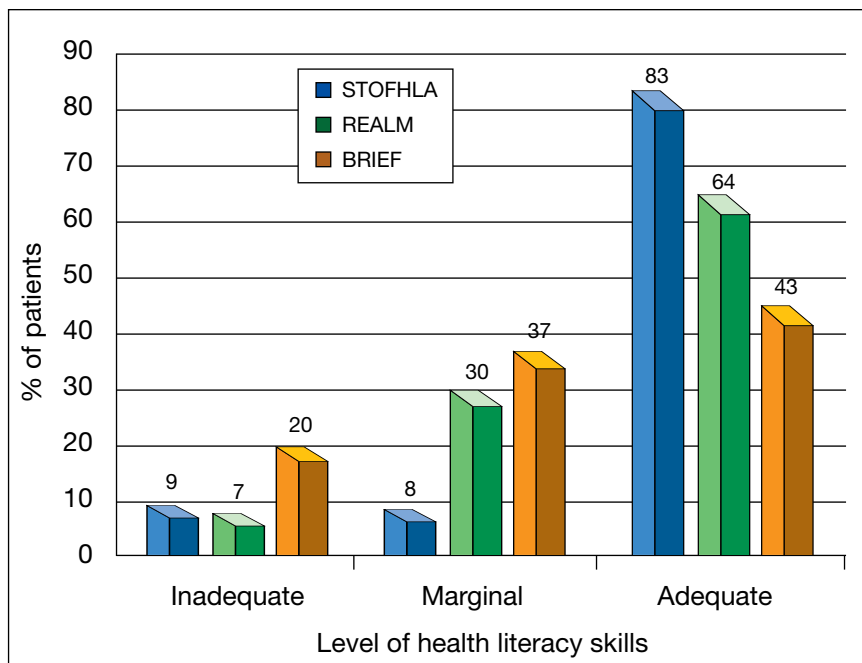


Figure. Study participants' levels of health literacy as indicated by the Short Test of Functional Health Literacy in Adults (STOFHLA), the Rapid Estimate of Adult Literacy (REALM), and the BRIEF.

dards, our results indicate there is an association between all three tools and that the association between the BRIEF and the validated tools is moderate.<sup>14</sup> The addition of the fourth item to the BRIEF, “How often do you have a problem understanding what is told to you about your medical condition?” increased the internal validity of the screening measure as indicated by the increased correlation coefficient (Table 3).

The principal component analysis findings suggested that the BRIEF measures one distinct construct, “health literacy” (eigenvalue = 2.388), accounting for 60% of score variance. The remaining eigenvalues were less than 1 and, thus, were not retained. These findings validate the BRIEF as a health literacy screening tool as compared to the REALM and the STOFHLA.

Using the REALM as the state variable, the BRIEF was slightly more

accurate at identifying respondents with inadequate skills than it was at identifying respondents with inadequate/marginal skills, as indicated by higher sensitivity (AUROC) scores for inadequate versus inadequate/marginal skills (Tables 3 and 4). Specifically, the BRIEF demonstrated .79 sensitivity (95% confidence interval [CI], .70–.87) for detecting inadequate skills and .69 sensitivity (95% CI, .64–.75) for detecting inadequate/marginal skills. Still using the REALM as the state variable, all four BRIEF items together had a higher AUROC than any of the individual items (Table 3), indicating that the tool as a whole is more sensitive than its components for identifying inadequate health literacy skills.

With the STOFHLA as the state variable, the BRIEF remained slightly more sensitive for inadequate health literacy skills than for inadequate/marginal health literacy skills (Tables

**Table 3. Pearson product moment correlation and AUROC<sup>a</sup> values for the BRIEF as a whole and as individual items, with the REALM<sup>b</sup> and the STOFHLA<sup>c</sup> as the state variables**

Test variable	<i>r</i> <sup>d</sup>	AUROC value (95% CI) <sup>e</sup>	
		Inadequate literacy	Inadequate/marginal literacy
<b>BRIEF compared to REALM</b>			
BRIEF overall	.40	.79 (.70–.87)	.69 (.64–.75)
BRIEF item 1	.34	.73 (.62–.84)	.63 (.57–.69)
BRIEF item 2	.38	.71 (.59–.84)	.68 (.63–.74)
BRIEF item 3	.28	.69 (.59–.79)	.65 (.59–.70)
BRIEF item 4	.21	.68 (.58–.78)	.59 (.53–.65)
<b>BRIEF compared to STOFHLA</b>			
BRIEF overall	.42	.76 (.69–.83)	.74 (.67–.80)
BRIEF item 1	.32	.66 (.56–.77)	.64 (.56–.72)
BRIEF item 2	.42	.75 (.65–.84)	.69 (.61–.77)
BRIEF item 3	.28	.65 (.56–.74)	.66 (.59–.73)
BRIEF item 4	.28	.68 (.59–.78)	.66 (.59–.74)

<sup>a</sup>AUROC = area under the receiver operating characteristic curve. <sup>b</sup>REALM = Rapid Estimate of Adult Literacy. <sup>c</sup>STOFHLA = Short Test of Functional Health Literacy in Adults. <sup>d</sup>*r* = Pearson product moment correlation coefficient. <sup>e</sup>CI = confidence interval.

3 and 4), with values of .76 (95% CI, .69–.83) and .74 (95% CI, .67–.80), respectively. All of the items had an AUROC greater than .5 at 95% CI. And with the STOFHLA as the state variable, the BRIEF tool retained a higher AUROC than any of its individual items (Table 3).

ANOVA results indicated that the three proposed BRIEF levels were significantly different from one another on the REALM ( $F$  score = 28.63,  $P < .0001$ ) and the STOFHLA ( $F$  score = 35.32,  $P < .0001$ ). Post-hoc Tukey analyses suggest all levels were significantly different at  $P < .0001$ .

## DISCUSSION

### Does the BRIEF measure up?

Our findings indicate that the BRIEF, the STOFHLA, and the REALM are

positively correlated and that the BRIEF can accurately identify participants with inadequate and inadequate/marginal health literacy skills. The BRIEF takes a shorter time than either the STOFHLA or the REALM to administer and score. In addition, we believe that the BRIEF may offer an advantage over the other two tools—which involve testing patients' literacy skills—in that it is less likely to be embarrassing to patients.

Despite the BRIEF's correlation with the other tools, however, its estimate that 20.1% of participants had inadequate health literacy was much higher than the REALM's estimate of 6.6% and the STOFHLA's estimate of 9%. It should be noted that the BRIEF estimate is closer to previous findings of larger studies, which suggest that 33% of patients have inadequate health literacy skills.<sup>1,2,15</sup>

Nevertheless, it is possible that the BRIEF's accuracy is hindered by false positives. At present, it cannot be determined if the discrepancies resulted from error in the BRIEF or from error in the REALM and the STOFHLA, although these discrepancies probably are related to the tools' measurement of slightly different aspects of health literacy.

Findings from this study should be interpreted with caution. Further research is needed to validate the BRIEF's effectiveness at determining rates of inadequate health literacy in the general population and in priority subpopulations. Although the three measures used in this study focus on different aspects of the concept of health literacy, contributing to error in measurement, the REALM and the STOFHLA currently are the most studied and validated health literacy screening measures available. Efforts to measure health literacy in diverse populations remain imperative, as researchers seek to understand the interpersonal and cultural contexts of communication in medical encounters.<sup>16</sup>

Several study limitations should be noted when interpreting our results. The homogeneous nature of our small sample may have influenced our findings, which cannot be generalized to other populations or geographical regions of the United States. Because the study did not use a randomized, controlled design, it may have failed to account for confounding variables that introduced measurement errors. The fact that our data were gathered through self-reports on the BRIEF and on the participant survey also limits the inferences that can be made from the study findings.

### The BRIEF in practice

Based on the outcomes of this study, the BRIEF was approved for a clinical

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**Table 4. Performance of the BRIEF in detecting inadequate and inadequate/marginal health literacy skills, by score, using the STOFHLA<sup>a</sup> and the REALM<sup>b</sup> as the state variables**

BRIEF score	STOFHLA				REALM			
	Inadequate health literacy		Inadequate/marginal health literacy		Inadequate health literacy		Inadequate/marginal health literacy	
	Sensitivity	1 – specificity	Sensitivity	1 – specificity	Sensitivity	1 – specificity	Sensitivity	1 – specificity
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.03	0.02	0.02	0.02	0.04	0.01	0.03	0.01
6.5	0.15	0.02	0.08	0.02	0.12	0.02	0.06	0.01
7.5	0.15	0.02	0.10	0.02	0.16	0.02	0.07	0.01
8.5	0.18	0.04	0.13	0.04	0.16	0.05	0.09	0.03
9.5	0.21	0.06	0.19	0.05	0.20	0.07	0.14	0.04
10.5	0.24	0.08	0.21	0.08	0.24	0.09	0.17	0.05
11.5	0.35	0.12	0.32	0.11	0.44	0.12	0.25	0.08
12.5	0.50	0.17	0.43	0.16	0.60	0.17	0.33	0.13
13.5	0.59	0.24	0.52	0.22	0.72	0.24	0.44	0.17
14.5	0.74	0.33	0.63	0.31	0.76	0.34	0.58	0.25
15.5	0.79	0.41	0.78	0.38	0.84	0.42	0.65	0.33
16.5	0.88	0.54	0.86	0.51	0.96	0.54	0.75	0.46
17.5	0.97	0.65	0.92	0.63	0.96	0.66	0.82	0.60
18.5	1.00	0.75	0.95	0.74	0.96	0.76	0.88	0.72
19.5	1.00	0.83	0.97	0.83	0.96	0.84	0.90	0.82
21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

<sup>a</sup>STOFHLA = Short Test of Functional Health Literacy in Adults. <sup>b</sup>REALM = Rapid Estimate of Adult Literacy.

trial in April 2007 within the participating North Florida/South Georgia Veterans Health System (NFSGVHS). This trial resulted in the implementation of the BRIEF throughout participating facilities in the NFSGVHS.

At these facilities, the BRIEF is used to generate clinical reminders within the electronic patient medical record system. When a patient's BRIEF score indicates inadequate health literacy, this fact is entered into the electronic record. Thereafter, a screen prompt pops up in the record to provide clinicians with steps

to help the patient understand health information. From July 1, 2007 to July 1, 2009, the BRIEF was used in NFSGVHS facilities to screen 112,442 patients—6,466 (6%) of whom were found to have inadequate health literacy.

### RECOMMENDATIONS FOR THE FUTURE

We recommend that other health care facilities use the BRIEF to screen patients' health literacy levels, document these levels in patient records, and tailor their approach to patients

accordingly. It is imperative that clinicians support patients by creating a shame-free, empowering approach to assessing and responding to their health literacy needs.<sup>17,18</sup> Empowering patients can minimize the stigma associated with low literacy and can help patients to take a leading role in their health care. The practical and legal implications of identifying and responding to individuals' needs based on the documented results of the BRIEF need to be addressed as a part of implementing the screening and posting process. ●

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