

# Can This Patient Read and Understand Written Health Information?

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## CLINICAL SCENARIO

A 67-year-old patient presents to your clinic for the first time 4 days following hospital discharge for a new diagnosis of atrial fibrillation. His heart rate is adequately controlled, and he was prescribed warfarin (5 mg daily) at discharge, with a plan for anticoagulation management. His international normalized ratio today is 1.4 (goal, 2-3), and you plan to enroll him in your nurse-run anticoagulation clinic but wonder about his ability to read and follow written instructions for managing his anticoagulation therapy.

## Why Is This an Important Question to Answer With a Clinical Evaluation?

Health literacy is “the degree to which individuals can obtain, process, and understand basic health information and services needed to make appropriate health decisions.”<sup>1</sup> The 2003 National Adult Assessment of Literacy estimated that 14% of adults had below basic literacy and an additional 22% had only basic literacy—resulting in more than 90 million US adults who may lack the literacy skills to effectively function in the current health care environment.<sup>2</sup> Written instructions are a key

**Context** Patients with limited literacy are at higher risk for poor health outcomes; however, physicians' perceptions are inaccurate for identifying these patients.

**Objective** To systematically review the accuracy of brief instruments for identifying patients with limited literacy.

**Data Sources** Search of the English-language literature from 1969 through February 2010 using PubMed, Psychinfo, and bibliographies of selected manuscripts for articles on health literacy, numeracy, reading ability, and reading skill.

**Study Selection** Prospective studies including adult patients 18 years or older that evaluated a brief instrument for identifying limited literacy in a health care setting compared with an accepted literacy reference standard.

**Data Extraction** Studies were evaluated independently by 2 reviewers who each abstracted information and assigned an overall quality rating. Disagreements were adjudicated by a third reviewer.

**Data Synthesis** Ten studies using 6 different instruments met inclusion criteria. Among multi-item measures, the Newest Vital Sign (English) performed moderately well for identifying limited literacy based on 3 studies. Among the single-item questions, asking about a patient's use of a surrogate reader, confidence filling out medical forms, and self-rated reading ability performed moderately well in identifying patients with inadequate or marginal literacy. Asking a patient, “How confident are you in filling out medical forms by yourself?” is associated with a summary likelihood ratio (LR) for limited literacy of 5.0 (95% confidence interval [CI], 3.8-6.4) for an answer of “a little confident” or “not at all confident”; a summary LR of 2.2 (95% CI, 1.5-3.3) for “somewhat confident”; and a summary LR of 0.44 (95% CI, 0.24-0.82) for “quite a bit” or “extremely confident.”

**Conclusion** Several single-item questions, including use of a surrogate reader and confidence with medical forms, were moderately effective for quickly identifying patients with limited literacy.

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component in health communication, and patients with limited literacy frequently do not understand prescription medication labels<sup>3</sup> or complex instructions like anticoagulation dosing.<sup>4</sup> This limitation is most common in older patients, those with lower education levels, immigrants, and racial/ethnic minorities.<sup>5-8</sup> Prior research has supported the association between literacy and disease knowledge, utilization of preventive services, hospitaliza-

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tion, overall health status, control of chronic disease, and mortality.<sup>9-14</sup>

Despite the important health implications of literacy, physicians are often unaware of their patients' literacy levels<sup>15,16</sup> and the effects on outcomes.<sup>17</sup> Patients may not volunteer they have a problem, because nearly one-half of patients with limited literacy express shame over their inability to read.<sup>18,19</sup> Although education attainment can be a proxy for literacy, it is often misleading, with many patients reading below their highest level of education<sup>20-23</sup> and up to 20% of high school-educated patients having limited literacy.<sup>5</sup> The implication for clinicians is that many patients will be unable to interpret prescription instructions, understand patient education materials, or use written information to prepare for clinical tests; however, clinicians often do not detect these limitations.

#### Measurement of Literacy: Reference Standards

Effective tools for measuring literacy are regularly used in research studies (the reference standards discussed herein are summarized in the eTable available at <http://www.jama.com>). The Test of Functional Health Literacy in Adults (TOFHLA), with a Spanish version available, is considered the most comprehensive reference standard and measures comprehension of written instructions and numerical information but requires up to 22 minutes to administer.<sup>24</sup> The test consists of 3 prose passages followed by a 50-item reading comprehension section that asks patients to fill in omitted words from a passage based on multiple-choice options. The passages are taken from instructions used by patients to prepare for an upper gastrointestinal tract radiograph series, the patient "Rights and Responsibilities" section of a Medicaid application, and a standard hospital informed consent document. There is also a 17-item numerical ability test that assesses the ability to comprehend prescription labels, blood glucose test results, clinic appointment

**Table 1.** Literacy Categories by Reference Standard

Reference Standard	Literacy Category		
	Inadequate	Marginal	Adequate
REALM (range, 0-66)	0-44 ( $\leq$ grade 6)	45-60 (grades 7-8)	61-66 ( $\geq$ grade 9)
TOFHLA (range, 0-100)	0-59	60-74	75-100
S-TOFHLA			
Weighted (range, 0-100)	0-53	54-66	67-100
Reading only (range, 0-36)	0-16	17-22	23-36

Abbreviations: REALM, Rapid Estimate of Adult Literacy in Medicine; S-TOFHLA, Test of Functional Health Literacy in Adults (short version); TOFHLA, Test of Functional Health Literacy in Adults.

slips, and financial information. A shortened version of the TOFHLA (S-TOFHLA) has been adapted that requires only 7 to 12 minutes to administer and includes 36 items from 2 prose passages and 4 items assessing numerical ability.<sup>25</sup>

A basic medical vocabulary is necessary for understanding and applying health information. In the Rapid Estimate of Adult Literacy in Medicine (REALM), the patient reads and pronounces 66 English medical words arranged in ascending order of difficulty. Points are given for correctly pronounced words, and scores (range, 0-66) are correlated with reading grade estimates, with accepted cut points of less than 61 corresponding to a less than ninth-grade reading level and less than 45 corresponding to a less than sixth-grade reading level.<sup>26</sup>

Although the REALM does not measure comprehension, it is highly correlated with both the TOFHLA and S-TOFHLA, with correlation coefficients of 0.84 and 0.80, respectively.<sup>24,25</sup> The most important differences between REALM and the S-TOFHLA are in the 25% to 75% interquartile range of the S-TOFHLA, where the correlation coefficient is only 0.62.<sup>25</sup> When compared with the S-TOFHLA as the reference standard for identifying patients with inadequate or marginal literacy, a REALM score less than 45 has a likelihood ratio (LR) of 8.3 (95% confidence interval [CI], 4.7-14), a score of 45 to 60 has an LR of 0.41 (95% CI, 0.26-0.63), and a score of 61 to 66 has an LR of 0.03 (95% CI, 0.004-0.18).<sup>25</sup>

While the REALM is treated as a reference standard in this review and most of the literature, it requires only 3 minutes to administer and may be the preferred method for identifying limited literacy when time is available.

Patients who score below an accepted threshold on literacy reference standards are described variably as having low, limited, or inadequate literacy. One of the challenges in understanding the relationship between literacy and health is determining what level of literacy is truly adequate to navigate the health care system such that a patient's reading ability poses no limitations. For the purposes of this review, we use the terms inadequate, marginal, and adequate literacy to mean the specific definitions for each reference standard shown in TABLE 1.

#### Prevalence of Limited Literacy in Health Care Settings

The prevalence of limited literacy varies substantially,<sup>5</sup> and there may be little added value from testing in clinic settings with a known high prevalence. A systematic review that pooled data from more than 300 studies estimated that 26% of patients had inadequate literacy and an additional 20% had marginal literacy, with a range between 0% and 68%.<sup>8</sup> These estimates reflect oversampling from health care settings serving patients with lower socioeconomic status and education and may therefore overestimate the prevalence nationwide. Among seniors enrolling in Medicare managed care plans, 34% of English-speaking and 53% of

Spanish-speaking enrollees had inadequate or marginal literacy.<sup>6</sup>

### Should I Evaluate My Patients for Limited Literacy, and What Can I Do With This Information?

The proper use of tools to identify limited literacy is controversial, with potential application as a screening tool to identify individuals who may need more assistance or for case finding to support or refute an increased suspicion for limited literacy in an individual patient. Some experts have expressed reservations about routine screening for limited literacy and point out that nearly half of patients with limited literacy are ashamed of their inability to read, and screening could potentially cause harm.<sup>18,19</sup> Those who oppose routine screening argue that conclusive evidence for specific interventions is lacking<sup>27</sup> and that recommended communication strategies are likely to benefit patients of all literacy levels and to harm none.<sup>28</sup> Providing information written at a low literacy level and communicating without medical jargon should be accomplished for all patients, not just those who screen positive for limited literacy. In particular, ensuring patients' understanding by having them "teach back" the material would provide universal precautions that ensure comprehension regardless of a person's literacy level.<sup>29</sup>

While nearly all physicians would agree with these recommendations, they may not effectively adhere to them owing to habit or the time limitations of a busy practice. There is evidence from a single randomized trial suggesting that physicians who were informed of their patients' limited literacy were 3 times more likely to use recommended communication strategies for patients with limited literacy but were less likely to feel satisfied and effective in their visits.<sup>30</sup> Sixty-four percent of physicians and 96% of patients felt that literacy screening was worthwhile by the end of the trial. In addition to improved patient-physician communication, there is also some evidence that

patients with limited literacy may benefit more from multifaceted interventions.<sup>31,32</sup> While the most appropriate role for literacy testing is still controversial, some physicians may reasonably choose to evaluate their patients' literacy and use this information to tailor their care. Thus, we identified and appraised brief instruments for identifying patients with limited literacy in clinical settings.

## METHODS

### Search Strategy

The literature review was conducted on articles published from 1969 through February 2010 and included any studies indexed in PubMed (including MEDLINE) and Psychinfo (eFigure). The key word search in PubMed included *literacy*, *numeracy*, *reading ability*, *reading skill*, *WRAT* (Wide Range Achievement Test), *wide range achievement*, *TOFHLA*, *test of functional health*, *REALM*, and *rapid estimate of adult*. For Psychinfo, we used only the term *health literacy* to limit search results. Our search yielded 2360 PubMed abstracts and 162 Psychinfo abstracts, and a query of experts and bibliographies yielded 2 additional abstracts not identified in the original search. All abstracts were independently reviewed by 2 members of the study team, and we selected only articles reporting on studies with participants 18 years or older that included an acceptable reference standard for literacy. We contacted the corresponding authors of 7 studies requesting additional information not included in the original manuscript<sup>33-39</sup>; 4 provided additional data included in this systematic review.<sup>35,37-39</sup>

For the reference standard, we accepted the REALM, Wide Range Achievement Test, TOFHLA, and S-TOFHLA. When multiple reference standards were used in a single study sample, we only report the results using the TOFHLA or S-TOFHLA. Based on these criteria, we identified 26 articles for full-text review and data abstraction. Each of these articles underwent independent full-text review by 2 re-

viewers. Studies were included if they reported original research on adult participants and included measures of diagnostic test characteristics or the data required to calculate this information. Studies were excluded if they did not meet these criteria; had 10 or fewer patients; were written in a language other than English; reported a screening test only for special populations, such as those with learning disabilities or cognitive impairment that directly affect reading ability; evaluated literacy within a specific content area (eg, genetics literacy); or only presented psychometric properties such as Cronbach  $\alpha$  without providing diagnostic test characteristics.

### Data Abstraction, Quality Ratings, and Statistical Methods

We abstracted information describing each study, including the health care setting, patient population, and sampling strategy. We collected information on diagnostic test characteristics including sensitivity, specificity, and LRs. When feasible, we separated results for tests performed in Spanish and English and also omitted data for patients with visual impairment when calculating diagnostic test characteristics. The abstraction from each reviewer was synthesized into a common data table, and disagreements were settled by a third reviewer.

Many of the questions asked patients to report their responses on a graded scale (eg, ranging from "always," "often," "sometimes," "occasionally," "never"), resulting in multiple potential cut points for each question. We present multilevel LRs, in which each response option is calculated as a positive LR compared with all other response options.<sup>40</sup> Some studies classified patients with marginal literacy as adequate, while other studies categorized marginal literacy as inadequate. Separate results for each categorization are presented when possible. We provide summary measures only for marginal literacy categorized together with inadequate literacy to fo-

cus on the broadest definition of limited literacy. While this values sensitivity over specificity, we believe this is most appropriate, given the higher risk of falsely reassuring (ie, false-negative) results.

Quality scores were assigned using the recommended approach for Rational Clinical Examination articles.<sup>41</sup> We considered studies to be of high quality (level 1) if they had all of the following: (1) sample sizes of at least 100 participants; (2) applied a reference standard regardless of the screening result; (3) independently interpreted the reference standard and screening instrument;

and (4) evaluated the screening questions in a sample that represented a wide spectrum of adult community or primary care patients. Level 2 studies did not meet at least 1 of these criteria but were not believed to be so flawed that the results were invalid. Examples of level 2 studies included studies conducted only in a sample with a particular disease (eg, diabetes). Level 3 studies had 1 or more flaws thought to likely invalidate the results. We retained only the level 1 and 2 studies for data synthesis.

When studies did not directly report the LRs, we calculated LRs

based on the available information to reconstruct the contingency table. For articles not reporting 95% CIs for the LRs, CIs were calculated using methods reported previously.<sup>42</sup> The summary LRs are the result of meta-analyzed data calculated in Comprehensive Meta-analysis version 2.2.048 (Biostat Inc, Englewood, New Jersey) using univariate random effects for the individual studies.<sup>43</sup> We measured heterogeneity using the *I*<sup>2</sup> statistic; however, even when statistical heterogeneity was present, the studies were similar enough in design that we chose to combine them into summary measures.

**Table 2.** Multi-item Tools for Identifying Inadequate or Marginal Literacy

Source	Sampling, Setting, Language	Highest Education Level and No. With Inadequate or Marginal Literacy <sup>b</sup>	Reference Standard	Age, Mean (Range), y	Quality <sup>c</sup>	Patient Response	LR (95% CI) <sup>a</sup>		
							Inadequate vs Marginal and Adequate Literacy <sup>b</sup>	Inadequate and Marginal vs Adequate Literacy <sup>b</sup>	
Newest Vital Sign							Range, 0-6		
Weiss et al, <sup>44</sup> 2005	Convenience, primary care, English (n = 250)	Mean, 12.7 y 39 (inadequate or marginal)	TOFHLA (English)	41 (18-85)	1	0-1		5.4 (3.6-8.0)	
							2-3	1.2 (0.66-2.3)	
							4-6	0.02 (0.001-0.32)	
	Convenience, primary care, Spanish (n = 250)	Mean, 10.7 y 88 (inadequate or marginal)	TOFHLA (Spanish)	41 (18-77)	1	0-1		1.8 (1.5-2.2)	
							2-3	0.59 (0.39-0.92)	
							4-6	0.03 (0.002-0.47)	
Osborn et al, <sup>45</sup> 2007	Convenience, primary care, English (n = 129)	24% <high school graduate 21 (inadequate) 48 (marginal)	REALM	49	1	0-1	1.8 (1.3-2.6)	2.1 (1.3-3.3)	
							2-3	1.0 (0.48-2.1)	1.1 (0.66-2.0)
							4-6	0.07 (0.01-1.1)	0.23 (0.11-0.48)
	Convenience, primary care, English (n = 119)	39% <high school graduate 37 (inadequate) 9 (marginal)	S-TOFHLA	55	1	0-1	2.6 (1.9-3.5)	3.0 (2.1-4.2)	
							2-3	0.16 (0.04-0.63)	0.24 (0.09-0.65)
							4-6	0.05 (0.003-0.71)	0.03 (0.002-0.51)
Summary LR (English only) <sup>44,45</sup>							0-1	3.2 (1.9-5.4)	
							2-3	0.77 (0.34-1.8)	
							4-6	0.08 (0.02-0.45)	
METER							Range, 0-40		
Rawson et al, <sup>39</sup> 2010	Convenience, cardiology clinic, English (n = 150)	Mean, 14.1 y 6 (inadequate) 22 (marginal)	REALM	63 (29-88)	2	0-20	120 (16-874)	21.8 (2.6-179)	
							21-34	1.0 (0.16-6.2)	7.7 (3.8-15.7)
							35-40	0.09 (0.006-1.3)	0.27 (0.14-0.52)

Abbreviations: CI, confidence interval; LR, likelihood ratio; METER, Medical Term Recognition Test; REALM, Rapid Estimate of Adult Literacy in Medicine; S-TOFHLA, Test of Functional Health Literacy in Adults (short version); TOFHLA, Test of Functional Health Literacy in Adults.

<sup>a</sup>Empty cells indicate that LRs could not be calculated because of unavailable data. Summary LRs provided only for marginal literacy categorized together with inadequate literacy, to focus on the broadest definition of limited literacy.

<sup>b</sup>Inadequate, marginal, and adequate literacy defined according to the reference standard.

<sup>c</sup>See "Methods."

**RESULTS**

We identified and included 10 unique studies that met all inclusion and exclusion criteria and provide data on 6 unique tests for limited literacy. All studies were conducted in the United States. Results are presented in TABLE 2, TABLE 3, and TABLE 4.

**Multi-item Tools**

**Newest Vital Sign.** The Newest Vital Sign test evaluates literacy based on reading and applying information included on an English or Spanish nutritional label from a pint of ice cream (2-6 minutes to administer).<sup>44</sup> Patients are asked 6 questions about serving size, nutrition information, and ingredients. Three separate levels have been suggested by the creators of this

test and were available for data synthesis: 0 through 1 correct answers on the English version had a summary LR of 3.2 (95% CI, 1.9-5.4) for inadequate or marginal literacy<sup>44,45</sup>; 2 through 3 correct answers were indeterminate, with a summary LR of 0.77 (95% CI, 0.34-1.8); 4 through 6 correct answers effectively ruled out inadequate or marginal literacy, with a summary LR of 0.08 (95% CI, 0.02-0.45). The Spanish version did not perform as well for identifying Spanish speakers with literacy problems (Table 2).

**Medical Term Recognition Test.** The Medical Term Recognition Test (METER) is a self-administered word recognition test patterned after the REALM. From a list of 40 medical words mixed with 40 nonwords, the pa-

tient marks only those items recognized as actual words (2 minutes to administer). In a single study of 150 mostly white patients awaiting a cardiac stress test, the METER was highly correlated with REALM scores, and 3 separate literacy categories were suggested based on METER scores of 0 through 20, 21 through 34, or 35 through 40. The METER had an LR of 22 (95% CI, 2.6-179) for inadequate and marginal literacy when only 0 through 20 correct words were identified; an LR of 7.7 (95% CI: 3.8-15.7) for 21 through 34 words; and an LR of 0.27 (95% CI, 0.14-0.52) for 35-40 words (Table 2).<sup>39</sup> Given the significant overlap in word recognition with the REALM, these LRs likely inflate the accuracy of this test; however, no stud-

**Table 3.** Single-item Questions for Diagnostic Tests for Identifying Inadequate or Marginal Literacy: Use of Surrogate Reader and Confidence With Medical Forms

Source	Sampling, Setting, Language	Highest Education Level and No. With Inadequate or Marginal Literacy <sup>b</sup>	Reference Standard	Age, Mean (Range), y	Quality <sup>c</sup>	Patient Response	LR (95% CI) <sup>a</sup>	
							Inadequate vs Marginal and Adequate Literacy <sup>b</sup>	Inadequate and Marginal vs Adequate Literacy <sup>b</sup>
Surrogate reader Williams et al, <sup>5</sup> 1995 <sup>d</sup>	Convenience, emergency department, English/Spanish, ≤grade 12 (n = 2659)	50% <high school graduate 775 (inadequate) 363 (marginal)	TOFHILA	37 (18-85)	1	Yes	4.4 (3.8-5.1)	
						No	0.55 (0.51-0.59)	
Chew et al, <sup>37</sup> 2008	Random, primary care, English (n = 1796)	9% <high school graduate 123 (inadequate) 132 (marginal)	S-TOFHILA	61	1	At least sometimes	2.7 (2.0-3.7)	2.5 (1.9-3.3)
						Rarely	1.0 (0.62-1.7)	1.0 (0.68-1.5)
						Never	0.58 (0.44-0.77)	0.67 (0.57-0.80)
Chew et al, <sup>36</sup> 2004	Convenience, preoperative clinic, English, ≤grade 12 (n = 332)	15% <high school graduate 15 (inadequate) 25 (marginal)	S-TOFHILA	46-54	1	At least sometimes	4.3 (2.9-6.4)	
						Occasionally	1.1 (0.39-3.1)	
						Never	0.10 (0.03-0.50)	
Morris et al, <sup>38</sup> 2006 <sup>e</sup>	Random, primary care, English (n = 999)	24% <high school graduate 104 (inadequate) 66 (marginal)	S-TOFHILA	65 (22-93)	2	At least sometimes	3.4 (2.7-4.3)	2.9 (2.3-3.7)
						Rarely	0.52 (0.29-0.93)	0.95 (0.69-1.3)
						Never	0.47 (0.33-0.68)	0.49 (0.38-0.64)
Jeppesen et al, <sup>35</sup> 2009	Convenience, primary care, English (n = 225)	16% <high school graduate 20 (inadequate) 14 (marginal)	S-TOFHILA	54	2	At least sometimes	3.7 (2.1-6.4)	4.6 (2.7-7.7)
						Rarely	1.8 (0.93-3.5)	1.3 (0.71-2.5)
						Never	0.22 (0.08-0.64)	0.34 (0.18-0.63)
Summary LR <sup>35,37,38</sup>						At least sometimes	2.9 (2.3-3.7)	
						Rarely	1.0 (0.80-1.3)	
						Never	0.53 (0.38-0.74)	

(continued)

ies have compared the METER with the TOFHLA.

**Single-item Questions**

**Use of a Surrogate Reader.** Five studies evaluated the use of surrogate readers as a marker for limited literacy.<sup>5,35-38</sup> This question was first asked directly by Williams et al as, “Do you usually ask someone to help you read materials you receive from the hospital?” (yes/no response).<sup>5</sup> Subsequent versions instead ask, “How often do you need to have someone help you when

you read instructions, pamphlets, or other written material from your doctor or pharmacy?”<sup>35,38</sup> or “How often do you have someone help you read hospital materials?”<sup>36,37</sup> Response options were “always,” “often,” “sometimes,” “rarely,” or “never.”

When patients respond “yes” to the question, “Do you usually ask someone to help you read materials you receive from the hospital?” the LR is 4.5 (95% CI, 3.8-5.1) for inadequate literacy, while a negative response has an LR of 0.55 (0.51-0.59).<sup>5</sup> When pa-

tients report the frequency of using a surrogate reader, a response of getting help “sometimes” or more frequently had a summary LR of 2.9 (95% CI, 2.3-3.7) for inadequate or marginal literacy; “rarely” had a summary LR of 1.0 (95% CI, 0.80-1.3); and “never” had a summary LR of 0.53 (95% CI, 0.38-0.74) (Table 3).

**Confidence With Filling Out Medical Forms.** In 3 studies patients were asked, “How confident are you filling out medical forms by yourself?”<sup>36,37,46</sup> Responses were “extremely,” “quite a

**Table 3.** Single-item Questions for Diagnostic Tests for Identifying Inadequate or Marginal Literacy: Use of Surrogate Reader and Confidence With Medical Forms (continued)

Source	Sampling, Setting, Language	Highest Education Level and No. With Inadequate or Marginal Literacy <sup>b</sup>	Reference Standard	Age, Mean (Range), y	Quality <sup>c</sup>	Patient Response	LR (95% CI) <sup>a</sup>	
							Inadequate vs Marginal and Adequate Literacy <sup>b</sup>	Inadequate and Marginal vs Adequate Literacy <sup>b</sup>
Confidence with medical forms <sup>f</sup> Chew et al, <sup>37</sup> 2008	Random, primary care, English (n = 1796)	9% <high school graduate 123 (inadequate) 132 (marginal)	S-TOFHLA	61	1	A little or no confidence	5.2 (3.2-8.4)	4.8 (3.0-7.7)
						Somewhat confident	2.2 (1.6-3.1)	2.6 (2.0-3.4)
						Quite a bit or extremely confident	0.48 (0.37-0.64)	0.59 (0.50-0.69)
Chew et al, <sup>36</sup> 2004	Convenience, preoperative clinic, English, ≤grade 12 (n = 332)	15% <high school graduate 15 (inadequate) 25 (marginal)	S-TOFHLA	46-54	1	A little or no confidence	5.6 (2.6-11.5)	
						Somewhat confident	2.5 (1.3-4.9)	
						Quite a bit or extremely confident	0.26 (0.15-0.70)	
Wallace et al, <sup>46</sup> 2006	Convenience, primary care, English (n = 305)	29% <high school education 54 (inadequate) 52 (marginal)	REALM	50	1	A little or no confidence	5.2 (3.6-7.5)	5.4 (3.4-8.8)
						Somewhat confident	0.69 (0.35-1.4)	1.7 (1.1-2.7)
						Quite a bit or extremely confident	0.26 (0.14-0.47)	0.31 (0.22-0.45)
Summary LR <sup>37,46</sup>						A little or no confidence		5.0 (3.8-6.4)
						Somewhat confident		2.2 (1.5-3.3)
						Quite a bit or extremely confident		0.44 (0.24-0.82)

Abbreviations: CI, confidence interval; LR, likelihood ratio; REALM, Rapid Estimate of Adult Literacy in Medicine; S-TOFHLA, Test of Functional Health Literacy in Adults.

<sup>a</sup>Empty cells indicate that LRs could not be calculated because of unavailable data. Summary LRs provided only for marginal literacy categorized together with inadequate literacy, to focus on the broadest definition of limited literacy.

<sup>b</sup>Inadequate, marginal, and adequate literacy defined according to the reference standard.

<sup>c</sup>See “Methods.”

<sup>d</sup>Question asked as, “Do you usually ask somebody to help you read materials received from the hospital?” Responses were yes/no. All other questions about using a surrogate reader were asked as, “How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?” with response options of “always,” “often,” “sometimes,” “rarely,” or “never.”

<sup>e</sup>LRs calculated excluding visually impaired participants.

<sup>f</sup>Question asked as, “How confident are you filling out medical forms by yourself?”<sup>36,37,46</sup> Responses were “extremely,” “quite a bit,” “somewhat,” “a little bit,” or “not at all.”

bit,” “somewhat,” “a little bit,” or “not at all.” In the 2 least-confident groups, patients had a summary LR of 5.0 (95% CI, 3.8-6.4) for inadequate or marginal literacy; those “somewhat confident” had a summary LR of 2.2 (95% CI, 1.5-3.3); and those expressing confidence were less likely to have a problem, with a summary LR of 0.44 (95% CI, 0.24-0.82) (Table 3).

**Self-rated Reading Ability.** Not surprisingly, patients who acknowledge trouble reading forms and written hospital materials have an LR of 28.6 (95% CI, 16.3-52.1) for inadequate literacy.<sup>5</sup> However, the LR of only 0.81 (95% CI, 0.78-0.84) suggests that many patients who deny they have a problem either overestimate their reading

ability or are reluctant to disclose their illiteracy.

Self-rated reading ability was also evaluated by asking, “How would you rate your ability to read?” with responses of “excellent,” “very good,” “good,” “okay,” “poor,” “very poor,” and “terrible.”<sup>35</sup> A response of “okay” or worse had an LR of 5.1 (95% CI, 3.2-8.3) for inadequate or marginal literacy; “good” had an LR of 1.0 (95% CI, 0.61-1.8), and “very good” or “excellent” had an LR of 0.16 (95% CI, 0.05-0.46) (Table 4).

**Difficulty Learning About Health.** In 2 separate studies, the question, “How often do you have problems learning about your medical condition because of difficulty understanding written infor-

mation?” was assessed as an indicator of limited literacy.<sup>36,37</sup> Response options were “always,” “often,” “sometimes,” “occasionally,” and “never.” A response of “sometimes” or more frequently had an LR of 2.4 (95% CI, 1.9-3.0); “occasionally” had an LR of 0.88 (95% CI, 0.64-1.2); and “never” had an LR of 0.65 (95% CI, 0.54-0.78) (Table 4).

**Combination Questions**

Four separate studies evaluated combinations of single-item questions along with educational attainment to see if a multi-item tool performed better than single questions.<sup>35-37,46</sup> No combination of questions or patient education level was able to significantly improve on the test characteris-

**Table 4.** Single-item Questions for Diagnostic Tests for Identifying Inadequate or Marginal Literacy: Self-reported Reading Ability and Difficulty Learning About Health

Source	Sampling, Setting, Language	Highest Education Level and No. With Inadequate or Marginal Literacy <sup>b</sup>	Reference Standard	Age, Mean (Range), y	Quality <sup>c</sup>	Patient Response	LR (95% CI) <sup>a</sup>	
							Inadequate vs Marginal and Adequate Literacy <sup>b</sup>	Inadequate and Marginal vs Adequate Literacy <sup>b</sup>
Self-reported reading ability Williams et al, <sup>5</sup> 1995 <sup>d</sup>	Convenience, emergency department, English/Spanish, ≤grade 12 (n = 2659)	50% <high school graduate 775 (inadequate) 363 (marginal)	TOFHLA	37 (18-85)	1	No	28.6 (16.3-52.1)	
							Yes	
							0.81 (0.78-0.84)	
Jeppesen et al, <sup>35</sup> 2009 <sup>e</sup>	Convenience, primary care, English (n = 225)	16% <high school graduate 20 (inadequate) 14 (marginal)	S-TOFHLA	54	2	Okay or worse	5.7 (3.7-8.8)	
							Good	
							0.29 (0.14-0.62) <sup>f</sup>	1.0 (0.61-1.8)
						Excellent or very good	0.16 (0.05-0.46)	
Difficulty learning about health Chew et al, <sup>37</sup> 2008	Random, primary care, English (n = 1796)	9% <high school graduate 123 (inadequate) 132 (marginal)	S-TOFHLA	61	1	At least sometimes	2.9 (2.2-3.7)	
							Occasionally	
							0.81 (0.48-1.4)	0.88 (0.64-1.2)
						Never	0.60 (0.45-0.81)	
							0.65 (0.54-0.78)	
Chew et al, <sup>36</sup> 2004	Convenience, preoperative clinic, English, ≤grade 12 (n = 332)	15% <high school graduate 15 (inadequate) 25 (marginal)	S-TOFHLA	46-54	1	At least sometimes	2.6 (1.6-4.3)	
							Occasionally	
							1.5 (0.54-4.4)	
						Never	0.33 (0.17-0.82)	

Abbreviations: CI, confidence interval; LR, likelihood ratio; REALM, Rapid Estimate of Adult Literacy in Medicine; S-TOFHLA, Test of Functional Health Literacy in Adults (short version); TOFHLA, Test of Functional Health Literacy in Adults.

<sup>a</sup>Empty cells indicate that LRs could not be calculated because of unavailable data. Summary LRs provided only for marginal literacy categorized together with inadequate literacy, to focus on the broadest definition of limited literacy.

<sup>b</sup>Inadequate, marginal, and adequate literacy defined according to the reference standard.

<sup>c</sup>See “Methods.”

<sup>d</sup>Question asked as, “Are you able to read forms and other written material from the hospital?” Responses were yes/no.

<sup>e</sup>Question asked as, “How would you rate your ability to read?” Responses were “excellent,” “very good,” “good,” “okay,” “poor,” “very poor,” or “terrible.”

<sup>f</sup>Data were unavailable for evaluating cutoff of “okay or worse/good” vs “excellent/very good” for patients with inadequate literacy.

tics of the best single-item test for each study.

### SCENARIO RESOLUTION

You estimate your patient's pretest probability of inadequate or marginal literacy at 34%, based on the estimated prevalence in the Medicare population. In discussing the use of warfarin for prevention of stroke, you ask, "How confident are you filling out medical forms by yourself?" He responds, "a little bit [LR, 5.0], but my wife helps take care of that stuff." The patient's posttest probability is more than 70%, and you recognize that additional time and effort may be needed to ensure adequate patient understanding. With his permission, you ask his wife to come in from the waiting room and join the discussion. You start by asking what they know about this new medication and why he is taking it. Being careful to avoid medical jargon, you carefully add to their explanation, including why it has to be checked so frequently. Before they go, you give him a hand-out, written below a sixth-grade level, with his medication instructions and follow-up appointment and ask him to teach back how he is to take this medicine and follow up. While these communication strategies are beneficial for all patients, you and your nurse are more cognizant of your patient's potential limitations and careful to take the time needed for clear health communication in all future interactions.

### BOTTOM LINE

Literacy can be measured accurately in health care settings with tests that require several minutes to administer; however, when time is limited, several single-item questions are effective. Based on the available data, questions about patients' confidence with medical forms or whether they use a surrogate reader both performed moderately well for identifying patients with inadequate and marginal literacy and have been evaluated in several studies. There

was limited evidence about the evaluation of literacy in Spanish-speaking patients, and it is not known whether the diagnostic test performance of these questions differs when asked by practicing clinicians.

Limited literacy is common and associated with health outcomes, but physicians are often unaware of patients' reading abilities.<sup>15</sup> To maximize patient safety and quality of care, it is essential that clinicians emphasize clear communication for all patients, whether using written, spoken, or other methods for delivering information. In some situations, clinicians may choose to screen and identify patients whose literacy poses a significant barrier to effective communication. When several minutes are available for testing, the REALM (3 minutes), S-TOFHLA (7-12 minutes), and possibly the METER (2 minutes) are the most accurate tools for identifying patients with limited literacy. However, for rapid testing we recommend asking patients how confident they are filling out medical forms, how often they have someone help them read health information, or to rate their own reading ability. Patients who test positive with these questions are at higher risk for poor health outcomes, and clinicians should regularly assess adequate recall and comprehension of information to promote high quality and safe delivery of health care.

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**Study concept and design:** Powers, Bosworth.

**Acquisition of data:** Powers, Trinh.

**Analysis and interpretation of data:** Powers, Bosworth.

**Drafting of the manuscript:** Powers, Trinh, Bosworth.

**Critical revision of the manuscript for important intellectual content:** Powers, Bosworth.

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### REFERENCES

- Institute of Medicine. *Health Literacy: A Prescription to End Confusion*. Washington, DC: National Academies Press; 2004.
- The Health Literacy of America's Adults. *Results from the 2003 National Assessment of Adult Literacy*. Washington, DC: National Center for Education Statistics; 2006.
- Davis TC, Wolf MS, Bass PF III, et al. Literacy and misunderstanding prescription drug labels. *Ann Intern Med*. 2006;145(12):887-894.
- Schillinger D, Machinger EL, Wang F, Palacios J, Rodriguez M, Bindman A. Language, literacy, and communication regarding medication in an anticoagulation clinic: a comparison of verbal vs. visual assessment. *J Health Commun*. 2006;11(7):651-664.
- Williams MV, Parker RM, Baker DW, et al. Inadequate functional health literacy among patients at two public hospitals. *JAMA*. 1995;274(21):1677-1682.
- Gazmararian JA, Baker DW, Williams MV, et al. Health literacy among Medicare enrollees in a managed care organization. *JAMA*. 1999;281(6):545-551.
- Wilson JF. The crucial link between literacy and health. *Ann Intern Med*. 2003;139(10):875-878.
- Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohlman LT, Rudd RR. The prevalence of limited health literacy. *J Gen Intern Med*. 2005;20(2):175-184.
- Powers BJ, Olsen MK, Oddone EZ, Thorpe CT, Bosworth HB. Literacy and blood pressure—do health-care systems influence this relationship? a cross-sectional study. *BMC Health Serv Res*. 2008;8:219.
- Mancuso CA, Rincon M. Impact of health literacy on longitudinal asthma outcomes. *J Gen Intern Med*. 2006;21(8):813-817.
- Schillinger D, Grumbach K, Piette J, et al. Association of health literacy with diabetes outcomes. *JAMA*. 2002;288(4):475-482.
- Wolf MS, Gazmararian JA, Baker DW. Health literacy and functional health status among older adults. *Arch Intern Med*. 2005;165(17):1946-1952.
- Dewalt DA, Berkman ND, Sheridan S, Lohr KN, Pignone MP. Literacy and health outcomes: a systematic review of the literature. *J Gen Intern Med*. 2004;19(12):1228-1239.
- Sudore RL, Yaffe K, Satterfield S, et al. Limited literacy and mortality in the elderly: the health, aging, and body composition study. *J Gen Intern Med*. 2006;21(8):806-812.
- Bass PF III, Wilson JF, Griffith CH, Barnett DR. Residents' ability to identify patients with poor literacy skills. *Acad Med*. 2002;77(10):1039-1041.
- Kelly PA, Haidet P. Physician overestimation of patient literacy: a potential source of health care disparities. *Patient Educ Couns*. 2007;66(1):119-122.
- Powell CK, Kripalani S. Brief report: resident rec-



- ognition of low literacy as a risk factor in hospital readmission. *J Gen Intern Med.* 2005;20(11):1042-1044.
18. Parikh NS, Parker RM, Nurss JR, Baker DW, Williams MV. Shame and health literacy: the unspoken connection. *Patient Educ Couns.* 1996;27(1):33-39.
  19. Wolf MS, Williams MV, Parker RM, Parikh NS, Nowlan AW, Baker DW. Patients' shame and attitudes toward discussing the results of literacy screening. *J Health Commun.* 2007;12(8):721-732.
  20. Baker FM, Johnson JT, Velli SA, Wiley C. Congruence between education and reading levels of older persons. *Psychiatr Serv.* 1996;47(2):194-196.
  21. Meade CD, Byrd JC. Patient literacy and the readability of smoking education literature. *Am J Public Health.* 1989;79(2):204-206.
  22. Davis TC, Crouch MA, Long SW, et al. Rapid assessment of literacy levels of adult primary care patients. *Fam Med.* 1991;23(6):433-435.
  23. Davis TC, Crouch MA, Wills G, Miller S, Abdehou DM. The gap between patient reading comprehension and the readability of patient education materials. *J Fam Pract.* 1990;31(5):533-538.
  24. Parker RM, Baker DW, Williams MV, Nurss JR. The test of functional health literacy in adults: a new instrument for measuring patients' literacy skills. *J Gen Intern Med.* 1995;10(10):537-541.
  25. Baker DW, Williams MV, Parker RM, Gazmararian JA, Nurss J. Development of a brief test to measure functional health literacy. *Patient Educ Couns.* 1999;38(1):33-42.
  26. Davis TC, Long SW, Jackson RH, et al. Rapid estimate of adult literacy in medicine: a shortened screening instrument. *Fam Med.* 1993;25(6):391-395.
  27. Pignone M, DeWalt DA, Sheridan S, Berkman N, Lohr KN. Interventions to improve health outcomes for patients with low literacy: a systematic review. *J Gen Intern Med.* 2005;20(2):185-192.
  28. Paasche-Orlow MK, Wolf MS. Evidence does not support clinical screening of literacy. *J Gen Intern Med.* 2008;23(1):100-102.
  29. Schillinger D, Piette J, Grumbach K, et al. Closing the loop: physician communication with diabetic patients who have low health literacy. *Arch Intern Med.* 2003;163(1):83-90.
  30. Seligman HK, Wang FF, Palacios JL, et al. Physician notification of their diabetes patients' limited health literacy: a randomized, controlled trial. *J Gen Intern Med.* 2005;20(11):1001-1007.
  31. Clement S, Ibrahim S, Crichton N, Wolf M, Rowlands G. Complex interventions to improve the health of people with limited literacy: a systematic review. *Patient Educ Couns.* 2009;75(3):340-351.
  32. Rothman RL, DeWalt DA, Malone R, et al. Influence of patient literacy on the effectiveness of a primary care-based diabetes disease management program. *JAMA.* 2004;292(14):1711-1716.
  33. Bass PF III, Wilson JF, Griffith CH. A shortened instrument for literacy screening. *J Gen Intern Med.* 2003;18(12):1036-1038.
  34. Arozullah AM, Yarnold PR, Bennett CL, et al. Development and validation of a short-form, rapid estimate of adult literacy in medicine. *Med Care.* 2007;45(11):1026-1033.
  35. Jeppesen KM, Coyle JD, Miser WF. Screening questions to predict limited health literacy: a cross-sectional study of patients with diabetes mellitus. *Ann Fam Med.* 2009;7(1):24-31.
  36. Chew LD, Bradley KA, Boyko EJ. Brief questions to identify patients with inadequate health literacy. *Fam Med.* 2004;36(8):588-594.
  37. Chew LD, Griffin JM, Partin MR, et al. Validation of screening questions for limited health literacy in a large VA outpatient population. *J Gen Intern Med.* 2008;23(5):561-566.
  38. Morris NS, MacLean CD, Chew LD, Littenberg B. The Single Item Literacy Screener: evaluation of a brief instrument to identify limited reading ability. *BMC Fam Pract.* 2006;7:21.
  39. Rawson KA, Gunstad J, Hughes J, et al. The METER: a brief, self-administered measure of health literacy. *J Gen Intern Med.* 2010;25(1):67-71.
  40. Simel DL, Samsa GP, Matchar DB. Likelihood ratios for continuous test results—making the clinicians' job easier or harder? *J Clin Epidemiol.* 1993;46(1):85-93.
  41. Simel DL, Keitz S. Update: primer on precision and accuracy. In: Simel DL, Rennie D, eds. *The Rational Clinical Examination: Evidence-Based Clinical Diagnosis.* New York, NY: McGraw Hill Medical; 2009:9-16.
  42. Simel DL, Samsa GP, Matchar DB. Likelihood ratios with confidence: sample size estimation for diagnostic test studies. *J Clin Epidemiol.* 1991;44(8):763-770.
  43. Hasselblad V, Hedges LV. Meta-analysis of screening and diagnostic tests. *Psychol Bull.* 1995;117(1):167-178.
  44. Weiss BD, Mays MZ, Martz W, et al. Quick assessment of literacy in primary care: the newest vital sign. *Ann Fam Med.* 2005;3(6):514-522.
  45. Osborn CY, Weiss BD, Davis TC, et al. Measuring adult literacy in health care: performance of the newest vital sign. *Am J Health Behav.* 2007;31(suppl 1):S36-S46.
  46. Wallace LS, Rogers ES, Roskos SE, Holiday DB, Weiss BD. Brief report: screening items to identify patients with limited health literacy skills. *J Gen Intern Med.* 2006;21(8):874-877.

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