

Assessing Health Literacy in Veterans with Diabetes

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Recognizing that successful management of diabetes hinges on patients playing an active role in their health care, these VA investigators set out to determine whether their diabetes educational materials were appropriate in the context of their patients' literacy levels.

Diabetes is a large and growing problem that affects the veteran population disproportionately.¹ In 2004, the disease was the sixth leading cause of death in the United States.² The prevalence of diagnosed diabetes rose from 5.1% in 1997 to 7.4% in 2005, while the percentage of U.S. adults with obesity—which increases the risk for diabetes—rose from 19.4% to 25.4% during the same period.³ Direct and indirect expenditures attributed to diabetes in 2002 were estimated at \$132 billion, or one out of every 10 health care dollars.⁴ In the United States, the number of inpatient hospital care days attributable to diabetes reached close to 17,000 in 2002.⁴ Economically disadvantaged and older people are especially susceptible to diabetes,⁵ and VA patients tend to be older, sicker, and poorer than the general U.S. population.¹ To deal with the problem, the VA has focused intensely on monitoring, tracking, and developing the standard of diabetes care in recent years.

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The VA's efforts, however, have not yet included assessments of two vital factors in diabetes management: patients' health literacy levels and the understandability of the educational materials provided to them. Health literacy represents a constellation of skills, including the ability to perform basic reading and numerical tasks that are required to function in the health care environment.⁶

These skills are particularly important in patients with diabetes, because self-management and education regarding self-management are critical components of diabetes care.^{5,7} Patients with diabetes can reduce the risk of complications significantly if they are educated about the disease and learn and practice the skills needed to enhance control of blood glucose, blood pressure, and cholesterol levels.⁸ Comprehensive education results in fewer hospitalizations, better glycemic control, and imputed economic savings.⁹ Health care system characteristics and the level of patient knowledge and empowerment also have an impact on the disease burden associated with diabetes.⁵ Furthermore, there are statistically significant associations between health literacy scores and glycosylated hemoglobin (HbA_{1c}) levels.¹⁰

Because of the important role that patient education plays in diabetes treatment, we conducted a study to assess the health literacy of diabetic patients at the VA Eastern Colorado

Health Care System (ECHCS) in Denver, and the understandability of educational materials provided to these patients. We collected demographic data on the patients, determined their health literacy levels, and estimated the grade levels of material being presented through diabetes educational classes and handouts. We then analyzed these data statistically to evaluate the understandability of the educational materials and uncover any demographic subgroups that might be particularly underserved.

HEALTH LITERACY AND DIABETES

According to the National Assessment of Adult Literacy (NAAL), conducted by the U.S. Department of Education (DoE) in 1992, nearly 40 million of the 191 million adults in the U.S. demonstrated skills in the lowest level of literacy—that is, they were able to complete no more than the most basic reading and numeric tasks.¹¹ In the most recent NAAL, conducted in 2003, average prose and document literacy scores were essentially unchanged from 1992.¹² Recognizing that low general literacy is associated with poor understanding of both written and spoken medical advice,¹³ the 2003 NAAL included an assessment of health literacy developed jointly by the HHS and the DoE.¹⁴ This study found that over 75 million adults had either basic or below basic health lit-

eracy and that average health literacy scores were lower among adults who were over age 65, had not completed high school, or were living below the poverty level.¹⁴

Some of the tasks that patients with low health literacy levels may find difficult include locating information on medication labels or in educational brochures, following directions to prepare for diagnostic tests, using appointment slips to remember upcoming provider visits, and completing informed consent documents.^{10,14} As a result of these challenges, patients' health outcomes may be compromised.^{10,13,15,16}

Prevention or management of type 2 diabetes often requires patients to follow dietary restrictions and exercise programs.¹⁷ In type 1 (and some cases of type 2) diabetes, patients must learn to monitor their own glucose levels and self-administer insulin, and they must keep track of appointments with multiple providers for periodic follow-up and screening. As such, providers caring for patients who are at risk for or have been diagnosed with diabetes have a responsibility to educate these patients about

48% of the entire sample and 44% of those with diabetes had inadequate functional health literacy.¹⁶ These patients were significantly less likely than those with adequate functional health literacy to know important facts about their disease and its management.¹⁶ Two other cross-sectional surveys found similar results, with at least 50% of diabetic patients having marginal or inadequate functional health literacy.^{10,18} Furthermore, in one of these studies, there was a statistically significant association between health literacy scores and glycosylated hemoglobin (HbA_{1c}) levels.¹⁰

STUDY DESIGN

This descriptive study was conducted at the VA ECHCS, a tertiary care VA medical center that supports specialty and primary care clinics. The study protocol was approved by the medical center's Institutional Review Board and Research and Development Committee.

The endocrinology clinic at the VA ECHCS holds a group education class—taught by a nurse, a dietician, a pharmacist, and a podiatrist—twice monthly for patients with newly or

graphic data (including age, sex, race, years of schooling, and native language) from study participants using questions based on those developed by the authors of the S-TOFHLA instrument.¹⁹

We transcribed the audio tape of the class—except for the portion taught by the pharmacist, which was inaudible on the tape—and used the Gunning Fog Index²⁰ to score the transcript for readability and understandability. We also used the Fog Index to analyze printed handouts used at the VA ECHCS for patient diabetes education.

We entered the demographic data, S-TOFHLA scores, and Fog Index scores into the SPSS statistical software package (SPSS Inc., Chicago, IL), double-checked it for accuracy, and computed descriptive statistics and correlations.

Instruments used

The S-TOFHLA is a 36-item, timed test that assesses the reader's level of functional health literacy. It was developed in response to a need for a shorter health literacy screening measure than the original TOFHLA instrument.²¹ The S-TOFHLA is a proven, valid, and reliable tool for measuring health literacy,^{19,22} and it can be used by health educators to identify individuals who require special assistance to achieve learning goals. We chose it for use in our study because it assesses reading comprehension (the ability to read and understand both prose passages and numerical information), along with the ability to read and correctly pronounce a list of words.¹⁹

Respondents to the S-TOFHLA answer questions within two passages. One is about x-ray preparation and the other contains questions from a Medicaid application. The passages are designed using the modified cloze

Over 75 million adults had either basic or below basic health literacy.

the disease and to encourage adherence to recommended regimens. In fact, the American Diabetes Association consistently has identified patient education as a critical component of diabetes care.⁷

Low health literacy is common among patients with diabetes. In a study of 402 patients with hypertension and 114 patients with diabetes,

previously diagnosed type 1 or type 2 diabetes. An investigator attended, audio-taped, and took field notes on one complete class. All patients attending this class—and additional attendees of subsequent classes—agreed to participate in the study and underwent the Short-Test of Functional Health Literacy in Adults (S-TOFHLA).¹⁹ We collected demo-

procedure, with every fifth to seventh word omitted and four multiple-choice options provided.²² The x-ray passage has a fourth grade readability level and the Medicaid passage has a tenth grade readability level.²²

S-TOFHLA scores can indicate inadequate functional health literacy (0 to 16), marginal functional health literacy (17 to 22), or adequate functional health literacy (23 to 36). Patients whose scores indicate adequate functional health literacy can be expected to read and interpret most health texts. Patients who have marginal or inadequate functional health literacy are likely to have difficulty reading, understanding, and interpreting most health materials, including directions for participating in their health care. As such, they are at greater risk for incorrect medication self-administration or nonadherence to prescribed diets or treatment regimens.²¹

The Gunning Fog Index is a quick, concise method of testing the grade level of educational materials. It was developed in the 1950s by Robert Gunning to encourage clear business writing techniques. Since then, it has been used widely in many disciplines.

To calculate the Fog Index, the number of words in a passage composed of several complete sentences are counted until they total about 100. This number of words is then divided by the number of sentences to get the average sentence length of the passage. The number of complex words—those with three or more syllables—are then counted for the passage. Finally, the average number of words per sentence is added to the number of complex words and multiplied by 0.4. The resulting number is the Fog Index. A Fog Index of 9 corresponds to a ninth grade reading level and a Fog Index of 12 corresponds to a twelfth grade reading level.²⁰

Table 1. Descriptive statistics for the 30 diabetic patients included in the health literacy study at the VA Eastern Colorado Health Care System

Parameter	Result
Total sample—no. of patients	30
Age (in years)—mean	55
Sex—no. of patients (%)	
Male	29 (97)
Female	1 (3)
Native language—no. of patients (%)	
English	27 (90)
Non-English	3 (10)
Highest level of education—no. of patients (%)	
Some high school	3 (10)
High school graduate	12 (40)
Some college	9 (30)
College graduate	4 (13)
Information unavailable	2 (7)
Health literacy level*	
Inadequate	3 (10)
Marginal	7 (23)
Adequate	20 (67)

*Health literacy level based on administration of the Short-Test of Functional Health Literacy in Adults (S-TOFHLA). Based on this test, a patient's functional health literacy is considered inadequate if the score is between 0 and 16, marginal if the score is between 17 and 22, and adequate if the score is between 23 and 26.

PATIENT HEALTH LITERACY

Of the 30 patients recruited to participate in our study, all but one were male (Table 1). The mean age for the group was 55 years. Three participants had some high school education but did not graduate, 12 were high school graduates, nine had some college education, and four were college graduates. All but three participants reported English as their native language, and the three individuals who were non-native English speakers all had adequate functional health literacy in English according to their S-TOFHLA scores.

Overall, S-TOFHLA scores revealed that 10 (33%) of the patients in our study had marginal or inad-

equately functional health literacy (Table 1). The other 20 patients (67%) had scores indicating adequate functional health literacy. Of the four patients who had graduated from college, three had inadequate functional health literacy and one had marginal functional health literacy.

We discovered a moderate negative correlation between age and health literacy level, with a Pearson's *r* value of $-.5$ ($n = 29$). There was no statistically significant relationship between years of schooling and health literacy level.

UNDERSTANDABILITY OF EDUCATIONAL MATERIALS

Results of the Fog Index analysis of the diabetes group educational class

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transcripts indicated that the nurse's portion of the class was taught at a grade level of 12.9, the dietician's portion was taught at a grade level of 10, and the podiatrist's portion was taught at a grade level of 11.5 (Table 2). On average, the entire class (excluding the pharmacist's portion) was taught at a grade level of 11.5. The mean grade level of the printed educational materials was 10.

PROVIDERS NOT TUNED IN TO PATIENTS' NEEDS

Although the majority of the subjects in this study were well educated and had adequate functional health literacy, one third showed marginal or inadequate functional health literacy. For these patients, the likelihood that their diabetes education needs are not being met is higher. This risk is compounded by the finding that both written and verbal content of diabetes educational materials provided at the VA ECHCS are prepared at advanced grade levels (tenth grade and above).

The average reading level of adults in the United States is eighth grade, and one in five adults reads at a level of grade five or below. It is generally believed that health education materials should be written at a sixth grade reading level, so that they can be read by the widest possible audience.²³ Research suggests that, while an extensive array of health education materials with relatively consistent content is available to patients through various media, many are written above this level.¹⁶ Our study results support this notion.

Adult learning principles must be taken into consideration when estimating patients' health literacy. It is possible that some individuals would be able to understand the content of oral presentations that they would find difficult to under-

Educational material	Grade level*
Verbal content (diabetes group education class) [†]	
Overall	11.5
Nurse	12.9
Dietician	10.0
Podiatrist	11.5
Written content (patient handouts)	10.0

*Grade level was assigned based on the Gunning Fog Index, which uses average sentence length, average word length, and proportion of complex words to assess the readability and understandability of written text. [†]Verbal education provided through the diabetes group education class was audio-taped, transcribed, and then analyzed using the Fog Index. The pharmacist-delivered portion of the class was not analyzed because it was inaudible on the tape.

stand in written form. Regardless, patients with inadequate or marginal health literacy will have difficulty performing such tasks as reading and comprehending printed educational materials and following directions on the labels of medications that are essential to the management of their disease.

Low health literacy levels may help explain why patients with less formal education tend to be at greater risk for health problems (such as obesity), compared with patients who've completed higher levels of formal education. According to Medical Expenditure Panel Survey data, individuals whose highest level of education was high school (complete or incomplete) were more likely to be obese (54.3%) than those who had attained at least some college education.²⁴

It is important to note, however, that our study participants who had graduated from college had some of the lowest literacy scores. Not all college educated individuals have adequate health literacy: The 2003 NAAL reported that 4% of adults with associate's degrees and 3% of adults with four-year college degrees or graduate level education had

below basic health literacy.¹² In addition, the age of our subjects could be a confounding variable in this study. Our findings lend support to previous studies that have demonstrated a decline in reading ability with advancing age.

STUDY LIMITATIONS

The Gunning Fog Index was designed and tested for reliability in assessing reading comprehension, not comprehension of spoken language. We used this method of calculating grade level on printed transcripts to illustrate the possibility that the index also can assess oral presentations. The index does not take the pauses, facial expressions, or body language of a presenter into account, however, and an oral presentation may increase the opportunity for a learner to seek clarification of unfamiliar vocabulary and concepts. Additionally, the S-TOFHLA does not determine the test taker's listening skills. These are clear limitations of our study.

Nevertheless, the Fog Index score for the class transcript indicated that the class was taught, on average, above the eleventh grade reading

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level. Thus, it is likely that the spoken content of the class contained so many words per sentence, sentences per paragraph, and words with three or more syllables that, in most cases, it would be much too complex for patients with low functional health literacy, whether they were reading or listening to the material.

CLOSING THE GAP

Preventing the complications of diabetes is both possible and essential to managing the disease and controlling its economic impact on individual patients and health care facilities. Clearly, health care providers have a key role in promoting disease prevention, but they are not the only players. The knowledge, beliefs, and attitudes of not only the patients but also their family, friends, and colleagues all affect diabetes management and outcomes.⁴ And the time patients spend with these individuals obviously greatly exceeds the time they spend with their health care providers.

To make the most of the time patients and providers share, therefore, it falls on providers to ensure that their patients are able to follow and understand the medical information they receive at these visits. This involves assessment both of patients' levels of comprehension and of components that affect understandability of text, including sentence length, sentence structure, and use of complex words. Specific assessment of functional health literacy is recommended to individualize instruction to each patient's needs. Assessment of health literacy is a critical step in ensuring that patients can comprehend the education provided to them. The S-TOFHLA is a valuable tool due to its unique ability to assess reading comprehension—a skill that is critical for successful disease management. At a minimum, providers

need to assess and reassess patients' knowledge and understanding about self-care by asking them to do, write, say, or show something to demonstrate their understanding.⁶ By performing such assessments and using this information to inform practice, we can contribute to the Healthy People 2010 initiative's goal of reducing disparities in health. ●

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REFERENCES

1. Perlin, JB. Moving strategies to action: 12 priorities in 12 months. Paper presented at: Senior Management Conference, VHA; August 4, 2004; Washington, DC.
2. Miniño AM, Heron MP, Smith BL. Deaths: Preliminary data for 2004. *Natl Vital Stat Rep*. 2006;54(19):1-49. Available at: www.cdc.gov/nchs/data/nvsr/nvsr54/nvsr54_19.pdf. Accessed September 11, 2006.
3. Schiller JS, Martinez M, Barnes P. *Early Release of Selected Estimates Based on Data from the 2005 National Health Interview Survey*. Hyattsville, MD: National Center for Health Statistics; June 21, 2006. Available at: www.cdc.gov/nchs/about/major/nhis/released200606.htm#6. Accessed September 11, 2006.
4. Hogan P, Dall T, Nikolov P, for the American Diabetes Association. Economic costs of diabetes in the US in 2002. *Diabetes Care*. 2003;26:917-932.
5. U.S. Department of Health and Human Services. *Healthy People 2010*. Vol 1. 2nd ed. Washington, DC: Government Printing Office; 2000. Available at: www.healthypeople.gov/Document/tableofcontents.htm#volume1. Accessed September 11, 2006.
6. Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs, American Medical Association. Health literacy. Report of the Council on Scientific Affairs. *JAMA*. 1999;281:552-557.
7. American Diabetes Association. Standards of medical care in diabetes—2006. *Diabetes Care*. 2006;29(suppl 1):S4-S42.
8. American Diabetes Association web site. *Complications of Diabetes in the United States*. Available at: www.diabetes.org/diabetes-statistics/complications.jsp. Accessed September 24, 2006.
9. Module M. Self-management and education. In: Department of Veterans Affairs. *Management of Diabetes Mellitus in Primary Care, Update 2003*. Washington, DC: VA/DoD Clinical Practice Guideline Working Group, Veterans Health Administration, Department of Veterans Affairs and Health Affairs, Department of Defense; December 1999 [Update 2003]. Office of Quality and Performance publication 10Q-CPG/DM-03. Available at: www.oqp.med.va.gov/cpg/DM/DM3_cpg/content/ModM/modM_fr.htm. Accessed September 15, 2006.
10. Schillinger D, Grumbach K, Piette J, et al. Association of health literacy with diabetes outcomes. *JAMA*. 2002;288:475-482.
11. National Institute for Literacy. *National Adult Literacy Survey*. Washington, DC: U.S. Department of Education; 1992. Available at: www.nifl.gov/nifl/facts/NALS.html. Accessed September 14, 2006.
12. Key findings—Demographics. National Assessment of Adult Literacy web page. Available at: nces.ed.gov/NAAL/index.asp?file=KeyFindings/Demographics/Overall.asp&PageId=16. Accessed September 14, 2006.
13. RTI International—University of North Carolina Evidence-based Practice Center. *Evidence Report/Technology Assessment No. 87. Literacy and Health Outcomes: Summary*. Rockville, MD: Agency for Healthcare Research and Quality; January 2004. AHRQ Publication No. 04-E007-1. Available at: www.ahrq.gov/clinic/epcsums/litsum.htm. Accessed September 14, 2006.
14. Kutner M, Greenberg E, Jin Y, Paulsen C, White S. *The Health Literacy of America's Adults. Results From the 2003 National Assessment of Adult Literacy*. Washington, DC: U.S. Department of Education; September 2006. Available at: nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2006483. Accessed September 14, 2006.
15. Parker RM, Ratzan SC, Lurie N. Health literacy: A policy challenge for advancing high-quality health care. *Health Aff (Millwood)*. 2003;22(4):147-153.
16. Williams MV, Baker DW, Parker RM, Nurss JR. Relationship of functional health literacy to patients' knowledge of their chronic disease: A study of patients with hypertension and diabetes. *Arch Intern Med*. 1998;158:166-172.
17. Knowler WC, Barrett-Connor E, Fowler SE, et al, for the Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346:393-403.
18. Nurss JR, El-Kebbi IM, Gallina DL, et al. Diabetes in urban African Americans: Functional health literacy of municipal hospital outpatients with diabetes. *Diabetes Educ*. 1997;23:563-568.
19. Baker DW, Williams MV, Parker RM, Gazmararian JA, Nurss J. Development of a brief test to measure functional health literacy. *Patient Educ Couns*. 1999;38:33-42.
20. Gunning R. *The Technique of Clear Writing*. Philadelphia, PA: McGraw Hill; 1968.
21. 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;10:537-541.
22. Nurss JR, Parker RM, Williams MV, Baker DW. *Test of Functional Health Literacy in Adults*. 2nd ed. Snow Camp, NC: Peppercorn Books & Press; 2001.
23. Doak C, Doak L, Root J. *Teaching Patients with Low Literacy Skills*. 2nd ed. New York, NY: Lippincott-Raven Publishers; 1996.
24. Rhoades JA, Altman BM, Cornelius LJ. *Statistical Brief #37. Trends in Adult Obesity in the United States, 1987 and 2001: Estimates for the Noninstitutionalized Population, Age 20 to 64*. Rockville, MD: Agency for Healthcare Quality and Research; 2004. Available at: 207.188.212.220/mepsweb/data_files/publications/st37/stat37.pdf. Accessed September 15, 2006.