

The Gap Between Patient Reading Comprehension and the Readability of Patient Education Materials

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Patient education materials and hospital forms are given to patients with little regard for their ability to read them. Nationwide sampling and data from the 1980 census suggest that a high proportion of patients cared for in public hospitals are functionally illiterate. In this study, 151 adult primary care patients in five different ambulatory care settings were tested for reading comprehension. Patient education materials and forms from each clinic were analyzed for readability using a standard computer program.

A large discrepancy was found between the average patient reading comprehension and the ability levels needed to read patient education materials. The average reading comprehension of public clinic patients was 6th grade 5th month. Most tested patient education materials required a reading level of 11th to 14th grade, and standard institutional consent forms required a college-level reading comprehension. In the public clinics there was a gap of more than 5 years between patient reading levels and the comprehension levels required by written patient materials.

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Patient comprehension is a prerequisite to patient compliance with medical instruction and health education.¹ Problems with patient comprehension are often discussed, but the implications of variations in education, literacy skills, and language barriers have not been adequately studied. Patient education materials, health questionnaires, and hospital forms are given to patients with little regard for their ability to read these forms.² Illiterate patients seldom voluntarily admit their reading deficiency and often try to conceal their illiteracy, even when directly asked about it.¹ Misunderstanding medical words or terms may interfere with all aspects of health care, including history taking, diagnosis, treatment, and prevention education.³

Although clinicians and researchers in public hospitals often ask patients how far they went in school, they

assume that reading ability corresponds roughly to educational level. Reading ability is rarely tested directly in medical settings. Prior studies of patient literacy have used patients' educational and reading decoding (recognition) levels to estimate literacy levels.^{4,5} Reading recognition tests evaluate an individual's ability to pronounce correctly words of various levels of difficulty. Such instruments can be used to screen for reading levels but cannot be used to assess patient understanding of words or concepts.

Of all the literacy skills needed in health care, reading comprehension is the most important. Understanding words in context is a complex process involving logic, language, and experience.¹ Previous studies have not assessed patients' reading comprehension because of time constraints and other practical limitations imposed by the medical setting. Although testing reading recognition and comprehension is a new concept in the health field, it has long been routine in education.⁶

Educators have measured the readability of written materials since the 1940s. Medicine has only recently recognized problems in this area. In previous articles reporting on readability of patient education materials, hospital forms, and condom instructions,^{1,2,5,7,8} the read-

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ability levels were manually calculated using one of 40 available formulas. Although the recent advent of computerized readability analyses has made it much easier to evaluate materials, only one article reported on the use of computer programs to determine the readability of written health materials.⁹ Several commercial software packages, such as PC-Style¹⁰ and Grammatik,¹¹ can quickly assess the readability of a word-processing text file.

This study was undertaken to (1) determine the reading comprehension level of primary care patients in several different types of outpatient settings, (2) use computerized analyses to determine the readability level of patient education materials and forms used in these clinic settings, and (3) compare patient reading comprehension with the readability of written clinic materials.

METHODS

A convenience sample of 151 adult primary care patients was recruited from five primary care settings (three university-based clinics, one community health center, one private practice office). The university and community clinics are public facilities serving poor and low-income families. Patients who appeared to be in severe discomfort from injury or illness were excluded from participating. Each participant was tested for reading recognition and comprehension levels, using the Peabody Individual Achievement Test (PIAT).¹² Education, age, employment status, and age at first pregnancy were elicited orally by research assistants using a structured questionnaire.

In the public clinics, a nurse gave the research assistant the charts of patients waiting to be seen. Patients were then called by the assistant to a private testing room and invited to participate in the study. In the private practice office, the nurse asked each patient whether he or she would consent to be tested. The confidentiality of test scores was emphasized to all participants, each of whom signed a consent form. Of 153 potential subjects, 2 refused to participate; the remaining 151 completed the study. The majority of the subjects were enthusiastic about the study and responsive to the testing procedure.

Two research assistants underwent 10 hours of training and pilot administration of the PIAT, during which each administered and scored the PIAT 10 times. The scoring of all tests was subsequently verified by one of the authors.

Population

Thirty patients in each of four public clinics and 31 in a private practice clinic were tested (Table 1). Subjects ranged in age from 17 to 83 years, with a mean age of 41;

TABLE 1. POPULATION CHARACTERISTICS OF STUDY SAMPLE

Characteristics	University Clinics (n = 90)	Community Clinic (n = 30)	Private Clinic (n = 31)
Mean age (y) (range)	39 (17-83)	43 (17-78)	42 (17-66)
Sex (%)			
Female	71	83	71
Male	29	17	29
Race (%)			
Black	71	100	6
White	29	0	94
Highest grade achieved (range)	10.5 (1-17)	10.2 (3-13)	13.4 (10-18)
Unemployed (%)	70	77	13

73% were female. Patients tested at a community public clinic were the oldest (mean age 43 years); 83% of these were female and 100% were black. Patients tested in the university public clinics were the youngest (mean age 39 years); 71% were female and 71% were black. Overall, 78% of subjects in the public clinics were black, and 94% of those in the private practice clinic were white.

The mean educational level of patients tested in the public clinics was just above 10th grade. More than one-half of these had dropped out of high school. Although the mean educational level of subjects in the private practice clinic was higher (13th grade 4th month), 20% of these patients had dropped out of high school. The majority of women dropped out because of pregnancy.

Testing Instruments

The PIAT¹² is a wide-range screening measure of achievement in mathematics, reading, spelling, and general information. This well-standardized instrument is used in schools, institutions, industry, and community agencies. The reading recognition subtest contains 84 items that range in difficulty from preschool through high school. Most patients required 5 to 10 minutes to take this test.

The reading comprehension subtest contains 66 items and took patients 5 to 40 minutes to complete. It was not given if the patient did not successfully complete the preschool items on the reading recognition subtest. With the reading comprehension items, the patient was asked to read a sentence silently. When the patient finished and indicated readiness, the research assistant flipped the page, revealing four alternate illustrations. The patient was asked to select the illustration that best represented

the meaning of the sentence just read. The sentences became progressively more difficult. The test was stopped when the patient missed 5 of 7 consecutive items.

Although word recognition is an important literacy skill, understanding words in context is a better indicator of literacy.⁶ For this reason, the only patient reading levels reported are PIAT comprehension scores, expressed as school grade equivalents.

Computerized Readability Analyses

Patient education materials, forms, and physician letters from each clinic were analyzed to determine the reading level needed to comprehend them. Two computer programs, PC-Style¹⁰ and Grammatik,¹¹ were used to ascertain readability. Both programs analyze the literacy level of word-processing text files by combining several established readability indicators: the number of words, the number of sentences, the average sentence length, and the number of syllables in each word. Grammatik calculates several different readability indices,^{13,14} whereas PC-Style calculates only a Fog Index.¹⁴ The Fog Index is based on the assumption that 75% of persons reading at a given grade level should be able to comprehend the material. The computerized Fog Index was chosen as the most pragmatic measure of readability.

Statistical Analysis

Statistical comparison of the mean educational level with the mean reading comprehension level for the five settings was conducted using one-way analysis of variance. In comparing all public clinics with the private clinic, Student's *t* test was used.

RESULTS

The average patient reading levels in all clinics were far below the comprehension level needed to read patient education materials and forms used in the clinics and local newspaper health articles. The mean reading comprehension among patients tested ranged from 5th grade 4th month in the community clinic to 10th grade 8th month in the private practice. The mean reading comprehension levels in all three university-based clinics were similar, averaging 6th grade 8th month (Table 2). Forty percent of all public clinic patients tested were reading below a 5th grade level and could be considered severely illiterate. Only one (3%) of the private patients was reading at this level.

Most written education materials required average reading comprehension grade levels of 11th to 14th (Table

TABLE 2. AVERAGE MEAN READING COMPREHENSION LEVEL, LAST GRADE COMPLETED, AND EDUCATION-COMPREHENSION GAP OF PATIENTS IN UNIVERSITY, COMMUNITY, AND PRIVATE CLINICS

	University Clinics	Community Clinic	Private Clinic
Reading comprehension level	6.8	5.4	10.8*
Last grade completed	10.5	10.2	13.4*
Education-comprehension gap (y)	3.7	4.8	2.6
*P < .01			

3). Of 150 materials analyzed, only 9 (6%) were written below a 9th grade level. Informed consent forms of the university clinics ranged from the 13th to the 31st grade level. Letters from physicians to their patients required an average reading grade level of 16th to 17th. Local newspaper articles on health and well-being ranged from 12th to 14th grade levels. Only 14% of public clinic patients tested were reading at or above an 11th grade level, compared with 55% of private patients.

Over 60% of all participants were reading at least three grade levels below the grade they last attended (Table 2). This pattern was most pronounced in the two clinics where over 90% of the patients tested were black. In these two clinics over one half the participants were reading at a level at least 5 years below grade level. Of the patients tested in these two clinics who had graduated from high school, 31% were reading on a 2nd to 4th grade level. Eighty-three percent of all unemployed patients tested were reading below the 10th grade level.

DISCUSSION

National surveys of the literacy of the general adult population have produced estimates of the prevalence of illiteracy ranging from 13% to 55%.¹⁵⁻¹⁸ The lower figure represents the percentage of American adults who are severely illiterate, i.e., reading at or below a 4th grade level. These adults cannot read clinic signs or the labels on food or medicine containers. The higher figure includes adults whose tested reading skills are marginal for meeting specific requirements of adult living. These individuals would have trouble comprehending newspaper articles, blue-collar and armed services work manuals, and antidote instructions on a can of pesticide.

English Language Proficiency Study data, coupled with demographic data from the 1980 census, suggested that a high proportion of patients cared for in public hospitals

TABLE 3. READABILITY LEVELS OF WRITTEN MATERIAL

Source of Material	Subject or Title	Readability Grade Level	
University Medical Center	Patient Consent Form	16.1	
Griffith HW: <i>Instructions for Patients</i> , (ed 2). Philadelphia, WB Saunders, 1975	Pregnancy problems	12.0	
	Infant feeding	11.4	
	Pelvic inflammatory disease	12.5	
	Gonorrhoea	15.7	
	Mumps	11.3	
	Chickenpox	13.1	
Pharmaceutical Company Booklets	Burroughs		
	<i>Genital Herpes</i>	13.6	
	Dista/Eli Lilly		
	<i>UTI in Women</i>	12.2	
	Merrell		
	<i>Woman Explains Vaginitis</i>	13.0	
	Ortho		
	<i>FYI . . . Vaginitis</i>	15.9	
Ross			
<i>How Child Learns About Sex Abuse</i>	13.3		
Searle			
<i>Understanding HBP</i>	11.4		
Searle			
<i>Common Vaginal Infections</i>	16.9		
Government Booklets			
	DHHS-PHS-FDA		
	<i>Diet for a Healthy Heart</i>	14.8	
DHHS-PHS-NIH			
	<i>High Blood Pressure</i>	8.6	
National Organizations			
	American Diabetic Association		
		<i>Take Charge of Your Health</i>	11.3
	American Heart Association		
		<i>What Women Should Know About HBP</i>	12.5
	Reye's Syndrome Society		
	<i>Fever, Aspirin and Reye's Syndrome</i>	19.3	
American Academy of Family Physicians			
	<i>Stopping Smoking</i>	15.7	
	<i>AAFP Stop Smoking Program</i>	10.6	
Alcoholics Anonymous			
		<i>12 Traditions</i>	12.6
	<i>12 Steps</i>	11.3	

across the country are functionally illiterate.^{16,19} Areas with high percentages of minorities and high rates of poverty and immigration had the highest percentages of individuals with low literacy levels.¹⁹ A disproportionate number of these people were black or Hispanic, did not finish high school, were unemployed, and lived in the central areas of large metropolitan cities. When these people require hospitalization, they tend to have longer stays and require more resources.²⁰

To be successful in encouraging patients to share responsibility for their medical care, physicians need to know how well patients understand, accept, and follow oral and written instructions.²¹ This need is especially applicable to physicians who work in public clinics. Although patients can help themselves only if they comprehend what is expected of them, physicians seldom evaluate how well or poorly patients understand health information.¹ Assessing patient comprehension is a necessary prerequisite to facilitating patient cooperation with medical instructions.

The most striking result in the present study was the 5-to 7-year discrepancy between the reading comprehension

of the average public clinic patient and the ability levels needed to read most patient education materials. All of the health education materials and physician-written communications analyzed in this study required a reading comprehension level far above that demonstrated by most of the public patients tested. Since this study used a convenience rather than a random sample of patients, these findings should be generalized to other populations with caution.

Table 4 contains excerpts from current university materials, which require high levels of reading comprehension, and excerpts from revised versions, which are written at levels that are more appropriate for the average patient's reading ability (6th grade 5th month). Even the revised material would be difficult for 40% of public patients, who have a reading comprehension below 5th grade level. The glaring discrepancy between written materials and patient reading ability suggests a critical need for developing and evaluating patient education materials designed for those with low literacy skills. Such materials should use simple words, short sentences, concrete concepts, and graphic illustrations to maximize ease of un-

TABLE 4. TWO EXAMPLES OF READING MATERIALS FOR PATIENTS: ORIGINAL AND REVISED VERSIONS

Example 1: Consent to Operation	Original (25th grade level)	Revised (6th grade level)
Example 2: Patient Education Material	Original (16th grade level)	Revised (7th grade level)
	I consent to the performance of operations and procedures in addition to or different from those now contemplated, whether or not arising from presently unforeseen conditions, which the above-named doctor or his associates or assistants may consider necessary or advisable in the course of the operation.	I agree to other operations or treatments. My doctors may learn more in surgery. They may think I need other treatments. My doctors will decide in surgery. I agree to let them do the things they think are needed.
	Angina pectoris is a symptom and not actually a disease. The term refers to a pain in the chest, usually under the sternum (breastbone), which is brought on chiefly by exercise or emotional upsets in a person who has a heart problem. The pain is usually relieved by rest alone, but goes away more quickly with the use of a medicine which helps to bring more blood to the heart muscle.	Angina is a feeling. It is not really a disease. The word means a pain in the chest. The pain is felt under the breastbone. A person who has heart trouble may feel this. Exercise or getting upset can cause the pain. The pain usually goes away with rest. It goes away faster if you take medicine. The medicine helps to bring more blood to the heart.

Understanding the key messages.¹ If patient reading levels were established and patient education materials were labeled with readability levels, patients could be given more appropriate materials.

An additional finding was the discrepancy between patients' education and their reading comprehension levels. Neither the clinician nor the researcher can assume that a patient who has completed a certain grade in school can read at a corresponding level. In fact, for the public patients in this study, as well as for those in the studies of Doak and Doak⁴ and Powers,⁵ reading level is about three to four grade levels below educational level.

Patients' appearance is also an unreliable basis on which to judge ability to read and understand health instructions.¹ Research assistants in this study noted that patients' literacy levels cannot be accurately estimated from the way patients present themselves. The research assistants were surprised at the low reading levels of some of the more articulate and well-groomed patients in the public clinics.

Despite the fact that illiteracy is now a common topic in the public media,²² medical and nursing literature contains little information about the effects of patient illiteracy on health care.^{2,3,5,7,8,21,23,24} The medical literature also reflects relatively little attention paid to the effects of limited formal education and low socioeconomic status on health care.^{20,23,25,26} Previous studies suggest that conventional patient education materials and physicians' instructions are ineffective with many patients in public hospitals.¹ One family practice article reports a large number of adult patients tested did not have a functional understanding of common medical terms.³ Nearly 50% defined the word "hypertension" as meaning nervous or easily upset.

Twenty-five percent thought "orally" meant how often one takes medicine. In the only study that directly tested patient reading levels, the average public service hospital patient's ability to recognize words was at the 7th grade level, even though most stated they were high school graduates.⁴ In another study,⁵ more than one half of emergency department patients tested could not read well enough to understand standard discharge information and most written instructions. No articles were found reporting results of direct testing of patient reading comprehension or raising the issue of potential effects of patient illiteracy on medical research.

Research is needed to develop and evaluate methods for quickly estimating a patient's literacy level and for improving written and oral communication between health professionals and patients with limited literacy skills. Research is also needed to identify causes of educational ineffectiveness and to formulate efficacious interventions. The need for improvement in communication skills between patients and medical providers offers an excellent opportunity for collaborative efforts among educators and health care professionals.

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