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The Association of Patients' Oral Health Literacy and Dental School Communication Tools: A Pilot Study

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Abstract

The aim of this pilot study was to assess adult patients' ability to read and understand two communication tools at the University of California, Los Angeles, School of Dentistry: the dental school clinic website and a patient education brochure pertaining to sedation in children that was written by dental school personnel. A convenience sample of 100 adults seeking treatment at the school's general dental clinic during 2012–13 completed a health literacy screening instrument. They were then asked to read clinic educational and informational materials and complete a survey. Analyses were conducted to determine the association between the subjects' oral health literacy and sociodemographics and their ability to locate and interpret information in written oral health information materials. SMOG and Flesch-Kincaid formulas were used to assess the readability level of the electronic and written communication tools. The results demonstrated an association between these adults' oral health literacy and their dental knowledge and ability to navigate health information website resources and understand health education materials. Health literacy was not associated with age or gender, but was associated with education and race/ethnicity. The SMOG Readability Index determined that the website and the sedation form were written at a ninth grade reading level. These results suggest that dental schools and other health care organizations should incorporate a health-literate approach for their digital and written materials to enhance patients' ability to navigate and understand health information, regardless of their health literacy.

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Ms. Tam and Ms. Yue contributed equally to this study.

Keywords

health literacy; oral health literacy; REALM-D; eHealth literacy; health education; dental education; dental school clinics; patient care; patient communications

Asystematic review in 2012 noted that “Health literacy is linked to literacy and entails people’s knowledge, motivation, and competence to access, understand, appraise, and apply health information in order to make judgments and make decisions in everyday life concerning health care, disease prevention, and health promotion to maintain or improve quality of life during the life course.”¹ Low health literacy is associated with poorer health status, increased risk of mortality, less use of preventive services, higher hospitalization rates, and less knowledge about disease management.² Possible reasons for limited health literacy include lack of educational opportunity, cognitive issues, learning disabilities, and the “use it or lose it” phenomenon.³ Low health literacy affects a large number of Americans. The National Center for Education Statistics reports that 90 million Americans have limited health literacy, including difficulty understanding, processing, and applying health information, and that populations at risk for limited health literacy include adults over the age of 65, minorities, immigrants, low-income families, and individuals with chronic mental and physical health conditions.⁴

U.S. adults with low literacy lack the skills needed to use complex health materials—a potential barrier to accessing or achieving appropriate oral health care.^{4,5} Health literacy skills include the ability to read and understand text and to locate and interpret information in documents. People with low health literacy may have difficulty accessing or utilizing the health care system, communicating effectively with oral health care providers,⁶ and understanding and interpreting health materials.⁵ Patients with low literacy are likely to have difficulty completing intake forms that may include their health history, giving informed consent, following professionals’ recommendations, and attending appointments.^{7,8} Low health literacy may result in patients’ and their oral health providers’ having difficulty managing chronic oral health conditions such as caries and periodontal disease.⁸ Further, poor oral health literacy has been associated with significantly poorer oral health status among children.^{9,10}

Increasingly, health care systems have turned to digital formats. eHealth literacy is defined as the “ability of people to use emerging information and communications technologies to improve or enable health and health care.”¹¹ eHealth literacy involves “the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem.”¹² A general assumption is that having information available online makes it more accessible; however, Sassi’s study found that those with better literacy skills were better able to obtain information.¹³ The Agency for Healthcare Research and Quality (AHRQ) suggests that health care systems evaluate their communication practices in order to remove literacy-related barriers.¹⁴

The aim of this pilot study was to assess adult patients’ ability to read and understand two communication tools at the University of California, Los Angeles (UCLA), School of Dentistry: the dental school clinic website and a patient education brochure pertaining to

sedation in children that was written by dental school personnel. We hypothesized that the clinic website and the written patient education form were not written in plain language for patients with low levels of literacy. We also hypothesized that there would be an association among health literacy, educational attainment, dental knowledge, and the ability to read and understand information on the dental school website and in the written education material.

Methods

This study was certified as exempt by the University of California, Los Angeles, Institutional Review Board (IRB #12-001090). A convenience sample of subjects who were awaiting initial screening appointments at the UCLA School of Dentistry's waiting room were approached between July 2012 and February 2013 by one of two dental student investigators (OY, AT). The subjects were asked face-to-face if they would be interested in completing a survey for a research project to help improve the school's information resources. A verbal consent was obtained after answering their questions, and the subjects were not compensated for participating. The criteria to be included in the study were to be at least 18 years of age and have the ability to listen, read, and speak English. Hearing and visually impaired subjects were not eligible to participate since subjects were asked to read the sedation form, web documents, and health literacy instruments without assistance. The survey questions were read aloud to the subjects; the survey took, on average, ten minutes to complete. Oral consent from the subjects was obtained prior to the start of the survey. To ensure privacy and confidentiality, participants were isolated from other people in the waiting room.

The dental students who conducted the interviews were second-year students. Prior to recruitment, each student was trained by the corresponding author on how to conduct subject recruitment and informed consent as well as how to present survey questions and administer the health literacy instruments. The student researchers read from a printed copy of the survey, and each subject had his or her own printed survey. Answers to the survey questions were recorded on paper by the student researchers. The surveys were administered in a standardized order as follows: sociodemographic variables, website-related questions, sedation form-related questions, health literacy questions, dental knowledge questions, and the health literacy measure, the REALM-D.¹⁵

Clinic Educational and Informational Materials

Two communication tools used at the school's clinic were selected for the study. One purpose was to assess the reading level of the materials offered for patients; the second was to evaluate the subjects' understanding of the materials.

For the first tool, we selected a two-page educational tool, "Sedation for the Anxious Child," created by personnel from the school's Children's Dental Center. This brochure provides information in bulleted format about safety, use of oxygen, and a child's state under sedation to parents of children having nitrous oxide sedation during treatment. In addition, screenshots were made and printed in color of the dental school's website pages regarding contact information, billing, how to request dental records, frequently asked questions, directions, and the link to patient forms.

Study Variables

A brief survey was developed to seek information about three primary variables: the subjects' health literacy, their dental knowledge, and their use and comprehension of the written and website information materials. The survey also collected sociodemographic information, including the subjects' age, gender, race/ethnicity, and education.

Health literacy—The oral health literacy of the patients awaiting their appointment time was determined using 38 of the 84 multi-syllable words on the validated Rapid Estimate of Adult Literacy in Medicine and Dentistry measure (REALM-D), resulting in an abbreviated version of the measure.¹⁵ Validation of the shortened 20-item REALMD-20 measure¹⁶ was still in process when the study was submitted to the IRB; therefore, we used both the REALMD-20 items and the remaining items on the list of the most difficult words in List 3 of the REALM-D. We eliminated all of the simple List 1 words from the REALM-D and all of the words from the REALM-D List 2 that were not included in the REALMD-20. Using the standard use protocol, the subjects were asked to pronounce the 38 medical/oral health words. Correctly pronounced words were scored as one point; incorrectly pronounced words received no points. The REALMD-20 scores ranged from 0 to 20; for the List 3, scores ranged from 0 to 28.

Two health literacy screening indicator items developed by Chew were also included.¹⁷ These questions ask how often the subjects need help reading/filling out forms and their difficulty understanding written health materials. These items were scored from 5 denoting significant challenge to 1 denoting little challenge (5=all, 4=most, 3=some, 2=a little, and 1=none of the time).

Dental knowledge—In order to provide a screening assessment of the subjects' general dental knowledge, three items were chosen from the Macek Comprehensive Measure of Oral Health Knowledge.¹⁸ These items represented the three domains in the instrument: treatment (identify the correct description of a root canal: removal of the nerve); preventive behavior (the recommended annual frequency of dental visits: twice a year); and anatomy (the correct anatomical name for the roof of the mouth: palate). Each correct answer was scored one point, and the three item scores were summed.

Use and comprehension of written and website information—The subjects were asked if they had looked at the dental school website before coming to the clinic for their appointment (Yes/No). Then, printed samples of the children's sedation form and the school website were presented to the subjects, and they were given time to read and look at the samples. The subjects were then asked questions about information in the materials. Regarding the sedation form, three multiple-choice questions were asked: whether the child will be asleep for the entire dental procedure, how nitrous oxide is administered, and what is given to the child to remove the effects of the nitrous oxide after the procedure is completed. The number of correctly answered items was summed for a sedation knowledge score, with a possible range of 0 to 3. Three open-ended questions about the material on the website were presented, requiring the subject to find the information needed to answer these questions: "If you were a new patient coming into the general clinic, what contact number

would you use and why?” (scored as one question); “How do you request your dental records?”; and “If I am a new patient at the clinic, what forms do I need to fill out and where can I get them?” Answers were recorded verbatim and coded later so that each accurate response was awarded one point. The website knowledge score ranged from 0 to 3.

Two readability indices were used to assess the readability and understandability of the dental school website and the pediatric sedation form. The Simplified Measure of Gobbledygook (SMOG) calculates an estimate of the grade level of a text by counting the number of polysyllabic words in three samples of ten sentences each, estimating the count’s square root (from the nearest perfect square), and adding three.¹⁹ The Flesch-Kincaid Readability Index calculates the approximate grade level by determining the average number of words per sentence and number of syllables per word, multiplying the average number of words by 0.39, adding it to the average number of syllables per word multiplied by 11.8, and subtracting 15.59 from the result (www.readabilityformulas.com).

Data analysis was conducted using Pearson’s correlation, chi square, and analysis of variance to determine the association between subjects’ sociodemographics and oral health literacy, accessing the website, and the summed three dental knowledge items, the website knowledge score, and the sedation knowledge score. For race and gender, analysis of variance was used to compare oral health literacy, dental knowledge, website knowledge score, and sedation knowledge score and how often an individual needed help to read and understand the written information. Statistical analysis of our data utilized Software Package for Statistics and Simulation (SPSS) Version 22 to run the Pearson correlation test.

Results

The convenience sample consisted of 100 participants, of whom the majority were male (56%), white (42%), between the ages of 31 and 65 (73%), and with at least some college education (73%) (Table 1). Half of the subjects reported that they had visited the dental school website before coming to the clinic. The race/ethnicity of the subjects who accessed the website varied significantly ($p=0.04$). Caucasian subjects (54%) reported the highest percentage of visiting the website followed by Hispanics (50%). The majority of African Americans (60%) and Asians (74%) reported that they did not visit the website. There were no significant differences in education level, age, or gender.

The SMOG readability index determined the website was written at a ninth grade reading level, ranging from eighth grade level (7.7) for billing information to tenth grade level (10.4) for the information for patients section. The Flesch-Kincaid Readability Index placed it at a tenth grade reading level, ranging from ninth grade (9.4) for the billing to twelfth grade (11.8) for the information for patients. The sedation form was written at a ninth grade (SMOG) or tenth grade reading level (Flesch-Kincaid) (Table 2).

Subjects who reported they had visited the website were asked about the types of information they sought prior to their first clinic visit, and the responses were recorded verbatim and then categorized. Of the 50 subjects who visited the website, the majority looked for registration forms (74%) and directions to the clinic (62%), followed by hours of

operation (52%), the person to contact for information (46%), types of services provided (44%), billing/insurance information (42%), and information about a dental problem (40%) (Table 3). The 50 subjects who did not visit the website were asked a similar question: what information they needed at the time of their first clinic visit. The majority reported that they had questions regarding directions to the clinic (30%), followed by billing/insurance information (28%) and registration forms (26%). A number of other types of information for each group were reported and are listed at the bottom of Table 3.

We assessed the subjects' health literacy using the REALM-D word recognition^{15,16} and the Chew screening instruments.¹⁷ Regarding the words used from the REALM-D, on average, 23 of the 26 medical words and 10 of the 12 dental words were pronounced correctly (range from three to 26 medical words and two to 12 dental words) (Table 4). Three words—amalgam, impetigo, and periodontitis—were correctly pronounced by fewer than 50% of the subjects. The mean REALMD-20 score was 17.01 of a possible 20 points (SD 2.88), and the mean REALM-D List 3 score was 23.73 of 28 possible points (SD 3.94).

Among these subjects, 57% correctly answered all three dental knowledge questions, 5% correctly answered all of the website questions, and 77% correctly answered all of the sedation knowledge questions. The subjects reported little challenge (score between 1 and 2) using the Chew health literacy screening items, on which the mean score for subject needs help reading/filling out forms was 1.41 (SD 0.668) and the mean score for subject having difficulty understanding written health materials was 1.602 (SD 0.834).

Analysis of variance and Pearson's correlation were used to assess associations between the sociodemographic variables and knowledge scores and the health literacy variables (Table 5 and Table 6). Education showed a significant association at the $p < 0.05$ level with the website score, as well as stronger associations ($p < 0.01$) with the REALMD-20, REALM-D List 3, and the Chew variable difficulty understanding written information. A trend was observed with the Chew item regarding needing help with forms ($p = 0.097$). Race/ethnicity was significantly associated with the REALMD-20 and the REALM-D List 3. Neither the knowledge scores nor the Chew screening items were significantly associated with race/ethnicity although a trend was observed at $p = 0.052$ for the dental knowledge score. Neither age nor gender demonstrated significant associations with the subjects' oral health literacy and the Chew variables. The Chew item regarding difficulty understanding written information was correlated with higher scores on the website questions. The REALMD-20 and the REALM-D List 3 measures were highly correlated with the dental knowledge and website knowledge scores. The REALM-D List 3 was correlated with the sedation knowledge score ($p < 0.05$).

Discussion

Results of this study showed an association between the participants' oral health literacy, as measured by the REALMD-20 or REALM-D List 3, and their ability to locate and understand information on the dental school website and their knowledge about dental health. The Chew health literacy screening item describing the subject's self-report of difficulty understanding written information was also associated with the ability to find

school website information, but not with dental health knowledge. Sedation knowledge, on which the majority of subjects correctly answered all items, did not show association with health literacy.

Importantly, we found that these patients who sought care at the school's clinic displayed a mismatch between literacy skills and the challenges the clinic may pose to them. The website and the sedation form were written at a ninth to tenth grade reading level, with some components of the website pages almost at the 12th grade reading level, far above the seventh grade level recommended by the federal government's health literacy toolkit.¹⁴ Such common material, if written at a high readability index or requiring complicated navigation, may impact patients' ability to understand and obtain pertinent information to make adequate health care decisions. Improving communication resources with rephrased information and images could improve comprehensibility and may allow patients to better utilize the health care system. The greater difficulty in answering questions about the website may represent another component of health literacy: the ability to navigate multiple pages to find information. The sedation form was written at the same or lower reading level than the website, but was presented in a simple written form.

In this study, half of the participants, including most African American and Asian subjects, did not look at the clinic's website before coming there. In efforts to improve the health care system, organizations increasingly have converted some of their communication tools to the Internet. An individual's ability to explore and understand health information provided on the Internet represents the individual's eHealth literacy,¹¹ more commonly known as digital literacy. Research has shown that there is an association between eHealth literacy and health outcomes, including communication with health care professionals, following pre- and postoperative instructions, self-management, and utilization of the health care system.¹¹ Individuals with low digital literacy do not benefit nearly as much from electronic health tools when compared to individuals with high digital literacy, thus reinforcing existing disparities.

Over 40% of the adult population in the United States has inadequate literacy levels needed to engage in a society using digital technology to promote health care.¹² It may be important for dental schools to emphasize to students and clinical staff that they should show the clinic website to patients and help them learn to find information on it, such as educational materials that could be useful in maintaining good oral health. It is equally important for dental schools to ensure that the digital information they provide is at a level conducive to achieving health goals for all patients. Integrating low literacy health approaches into digital as well as printed health information may begin to help reduce health literacy disparities,¹¹ enhancing the ability of all individuals to navigate through the complex medical system and address their medical needs.

Based on this study, we would recommend educating students about brief health literacy measures, such as the REALMD-20, REALM-D List 3, or the Chew questions, as students begin to treat patients in the clinic. A significant part of being able to provide comprehensive dental treatment is to first establish a baseline of where patients stand in terms of knowledge and comprehension. As health care providers, students treat patients with many levels of

educational background, various times to learn a new habit, and differing ability to comprehend verbal and visual information. Teaching students to assess a patient's initial state will aid in the dental provider's ability to educate and treat patients effectively. By meeting the communication needs of the patient, a patient-doctor rapport is established; the patient will receive personalized quality care; and the provider will be able to treat patients more successfully.

Health care organizations can adopt practices to maximize the ability of individuals to access health care, understand health information, and make informed decisions about their health care.¹⁴ In 2012, an Institute of Medicine discussion paper identified ten attributes of a health-literate organization. Two of these attributes describe the organization's responsibility to design and distribute "print, audiovisual, and social media content that is easy to understand and act on" and provide "easy access to health information and services and navigation assistance."²⁰ Simply stated, a health-literate organization should produce patient information materials such as intake forms, consent forms, and preoperative/postoperative directions, whether on paper or web-based, that are easy to understand and navigate. The intent of the recommendations is to ensure that all patients can obtain relevant information about their health care provider; understand medical advice and treatment directives; evaluate treatment options; make and show up for follow-up appointments; and make appropriate health decisions.

This study represents a small pilot study on a convenience sample in one large metropolitan city, thus limiting the generalizability of the results. Further, because this was a pilot study, the study contained only a limited number of dental, website, and sedation form knowledge items, and we do not know why the patients did not access the website before coming for their appointment. In addition, when presented with the website questions, the subjects were flipping through a printout of the dental school website and were not asked to bring up and search through the actual website itself. These findings should be replicated to determine if other samples show similar education and race/ethnic differences in website usage and in oral health knowledge.

Conclusion

Findings from this study found an association among the participants' oral health literacy, education level, and ability to understand information from a website, written education materials, and basic dental knowledge. Health care organizations may wish to modify their digital and written materials to complement the literacy levels of their target populations in order to enable patients to make appropriate health-related decisions.

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Table 1

Description of sample by whether or not participants accessed the clinic’s website prior to first visit (N=100)

Characteristic	Number	Accessed School Website	
		No	Yes
Gender			
Male	56	25 (45%)	31 (55%)
Female	44	25 (57%)	19 (43%)
Age			
18–30 years	17	11 (65%)	6 (35%)
31–50 years	47	21 (45%)	26 (55%)
51–65 years	26	13 (50%)	13 (50%)
66 years or over	10	5 (50%)	5 (50%)
Race *			
African American/other	15	9 (60%)	6 (40%)
Asian	19	14 (74%)	5 (26%)
White/Caucasian	42	15 (36%)	27 (64%)
Hispanic	24	12 (50%)	12 (50%)
Education			
High school or GED	27	15 (56%)	12 (44%)
Some college and beyond	73	35 (48%)	38 (52%)
Total	100	50 (50%)	50 (50%)

* Pearson’s chi-square value: p=0.04, df=3

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Table 2

Grade level of website and sedation form based on SMOG and Flesch-Kincaid readability indexes

	SMOG	Flesch-Kincaid
Website		
Home page	9.9	11.0
Billing	7.7	9.4
FAQs	8.3	8.9
Information for patients	10.4	11.8
Directions	8.8	9.9
Website mean	9.02	10.2
Sedation form mean	9.0	10.2

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Table 3

Types of information participants desired prior to first appointment by whether patient visited the website

Type of Information	Those Who Visited Website (N=50)		Those Who Did Not Visit Website (N=50)	
	Number	Percentage	Number	Percentage
Who to contact for information	23	46%	9	18%
Directions to the clinics	31	62%	15	30%
Hours of operation	26	52%	6	12%
Billing/insurance information	21	42%	14	28%
Information about a dental problem	20	40%	9	18%
Asking for patient records	6	12%	1	2%
Registration forms to come to the dental clinic	37	74%	13	26%
Type of dental services the clinic offers	22	44%	8	16%
Other	6 ^a	12%	9 ^b	18%

^aComments were “eligibility to become a patient,” “general information to become a patient of the clinic,” “services available for disabled individuals and information about Ryan White programs,” and “the new patient process is missing.”

^bComments were “are appointments first come first serve?,” “becoming a patient and getting needs met,” “gum problem,” “how to find the parking lot and general clinic,” “confusion about different dental clinics,” and “insurance.”

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Table 4
 Medical and dental words used in REALM-D 20 and REALMD List 3, by number of times correctly pronounced by participants

Medical Words	Number Correct	REALMD-20	REALM-D List 3	Dental Words	Number Correct	REALMD-20	REALM-D List 3
Fatigue	95	X		Caries	91	X	
Jaundice	86	X		Abscess	88	X	
Depression	99	X		Dentures	96	X	
Directed	97	X		Hygiene	93	X	
Allergic	91	X	X	Insurance	100	X	
Menstrual	93		X	Calculus	89	X	
Testicle	95		X	Extraction	95	X	X
Colitis	73	X	X	Amalgam	47	X	X
Emergency	94		X	Bacteria	97		X
Medication	95		X	Gingivitis	82	X	X
Occupation	97		X	Anesthetic	85	X	X
Sexually	87		X	Periodontitis	30	X	X
Alcoholism	95		X				
Irritation	96		X				
Constipation	96	X	X				
Gonorrhea	90		X				
Inflammatory	89		X				
Diabetes	93		X				
Hepatitis	90		X				
Antibiotics	93		X				
Diagnosis	88		X				
Potassium	97		X				
Anemia	89	X	X				
Obesity	94		X				
Osteoporosis	79	X	X				
Impetigo	23		X				
Mean score (range)		17.01 (3–20)		REALM-D List 3		23.73 (3–28)	

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Medical Words	Number Correct	REALMD-20	REALM-D List 3	Dental Words	Number Correct	REALMD-20	REALM-D List 3
Standard deviation			2.88		3.94		

Table 5
Associations among participants' sociodemographic variables, knowledge, and health literacy variables

	Knowledge			Health Literacy			Health Literacy, Chew Difficulty Understanding Written Information
	Dental Knowledge Score	Website Knowledge Score	Sedation Knowledge Score	REALMD-20	REALM-D List 3	Help with Forms	
Education							
GED or less	2.26	1.00*	2.78	15.30**	21.74**	1.593	2.000**
Some college or more	2.51	1.41*	2.59	17.64**	24.47**	1.343	1.451**
Race							
Black	2.07	1.20	2.33	15.80*	22.00**	1.47	1.80
White	2.64	1.45	2.74	17.76*	24.88**	1.31	1.45
Hispanic	2.29	1.04	2.50	16.00*	22.17**	1.50	1.83
Asian	2.47	1.37	2.84	17.58*	24.53**	1.47	1.47

Note: Association was significant in two-tailed analysis using Pearson's correlation.

* p 0.05,

** p 0.01

Table 6

Associations between participants' knowledge and health literacy variables

	Knowledge			Health Literacy	
	Dental Health Knowledge Score	Website Knowledge Score	Sedation Knowledge Score	REALMD-20	REALM-D List 3
Health Literacy, Chew					
Help with forms	-0.061	-0.146	0.160	-0.134	-0.184
Difficulty understanding written information	-0.102	-0.221**	-0.026	-0.175	-0.171
REALMD-20	0.304**	0.379**	0.189	NA	NA
REALM-D List 3	0.318**	0.415**	0.228*	NA	NA

Note: Association was significant in two-tailed analysis using Pearson's correlation.

* p 0.05,

** p 0.01