Evaluation of Diabetes and Cardiovascular Disease Print Patient Education Materials for Use With Low–Health Literate Populations

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OBJECTIVE — Populations with the lowest literacy and health literacy in the U.S. are also among those disproportionately burdened by diabetes and its complications. Yet, suitability of publicly available diabetes and cardiovascular (CVD) patient education materials for these patients is not clear. We evaluated selected American Diabetes Association (ADA) and American Heart Association (AHA) print education materials for accessibility and usability characteristics.

RESEARCH DESIGN AND METHODS — English-language, print patient education brochures addressing lifestyle/behavioral management of diabetes and CVD were obtained from the ADA (n = 21) and the AHA (n = 19). Materials were evaluated using 32 criteria, 23 addressing literacy demand and 9 addressing behavioral activation, compiled from authoritative sources on development of low-literacy consumer health information.

RESULTS — Of the 32 criteria identified by two or more sources, ADA materials consistently met 11 (34%) and AHA materials consistently met 8 (25%). Criteria most frequently achieved were text case, use of cues (e.g., bullets) to emphasize key points, design of graphics/illustrations, some provision of "how to" information, and positive depiction of cultural images. The least consistently achieved criteria were reading grade, word usage (e.g., scientific jargon), sentence length, font size, line length, white space, visual organization, limited scope, clear and specific (e.g., step-by-step) behavioral recommendations, and demonstration of audience relevance and cultural appropriateness.

CONCLUSIONS — Materials consistently met few criteria for usability by patients with low literacy, limited prior medical knowledge, and/or limited resource availability. Use of available criteria and methods for increasing reach of print education materials to these underserved patient populations is indicated.

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A national priority for improving health outcomes is creating informed patients who participate in health care processes, decision making, and disease prevention and management (1). Professional medical associations, including the American Diabetes Association (ADA) and American Heart Association (AHA), contribute to this mission, in part by providing health information for patient education. However, health literacy—the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (2–4)—impacts usability of education materials.

Thirty-five percent of U.S. adults fall in the lowest health literacy categories of basic and below-basic health literacy skills (5), and health literacy needs are magnified in underserved populations. Among blacks and Hispanics, 58 and 66%, respectively, are in the lowest health literacy categories. Among people aged ≥65 years, 59% fall in the lowest health literacy categories. Low literacy, less education, and poverty are also associated with lowest health literacy (5).

To reach populations disproportionately affected by diabetes and its complications, therefore, patient education materials must meet criteria for understandability by individuals with moderate to very low literacy and must be communicated in a manner that facilitates comprehension and application (3). The purpose of this study was to evaluate these accessibility and usability characteristics of selected ADA and AHA print education materials.

RESEARCH DESIGN AND METHODS

— ADA and AHA patient education materials meeting the following criteria were sought for inclusion in the study: print format, content addressing behavioral management of diabetes and cardiovascular disease (CVD) or CVD risk in individuals with diabetes, material written for an adult audience, and English language. Materials in the Diabetes & CVD Toolkit, comprising patient education brochures designed for health professionals to distribute to their patients, were obtained electronically from the ADA Web site (http://www.diabetes.org/for-health-professionals-and-scientists/CVD.jsp). Twenty-one of 26 items met inclusion criteria. Reasons for exclusion were as follows: content did not explicitly focus on diabetes and CVD self-management behaviors (e.g., prediabetes, depression) (n = 3) or item was a log sheet rather than an educational brochure (n = 2).

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Abbreviations: ADA, American Diabetes Association; AHA, American Heart Association; CVD, cardiovascular disease.

Requests for each of 44 titles were placed via the AHA Web site (http://www.americanheart.org/presenter.jhtml?identifier=1200021) for mailing to the investigators. Eighteen requested titles were received. An additional six titles that were not found on the website were also received. Nineteen of these 24 materials met inclusion criteria. Five were excluded due to focus on a specific cardiac concern but without a direct diabetes focus in the text (e.g., bypass surgery, congenital heart disease, cardiac catherization, managing angina, and recovery from heart attack).

Materials were evaluated using 32 consensus criteria from widely cited authoritative sources on development and evaluation of low literacy and understandable consumer health information (6–8). Criteria addressing literacy demand (characteristics that impact approachability, readability, processing, and comprehension of print information) and behavioral activation (characteristics that impact meaningfulness, application, and usability of print information) were compiled.

Entire document review, including page-by-page and item-by-item analyses, was used to evaluate most criteria. For reading level, use of active voice, and sentence, paragraph, and line length, a sampling method described by Doak et al. was used (7). Three samples of text (from the beginning, middle, and end), totaling ~30 sentences, were systematically extracted from each print brochure. Reading grade level and reading ease scores were determined using the Flesch-Kincaid analysis, obtained via computer calculation in Microsoft Word, 2003.

Two reviewers (F.H-B., A.S.) evaluated materials for each of the criteria. Operational definitions used for objective evaluation of each criterion are listed in supplemental Table 3 (available in an online appendix at http://dx.doi.org/10.2337/dc07-1365). Final ratings resulted from discussion and consensus. Because of the document review procedures and operational definitions utilized, there was rarely disagreement between reviewers regarding whether a criterion was met.

RESULTS — Evaluation criteria are listed in Table 1. ADA materials successfully met 11 of 32 criteria (34%), and AHA materials met eight (25%). Overall, 6 of 23 literacy-demand criteria, including use of typographic cues (e.g., bullets) to emphasize key points, graphics design and layout, and font style and case, were achieved across brochures. Two of nine behavioral activation criteria were achieved by all brochures: inclusion of "how to" information and positive depiction of cultural images.

Unmet literacy-demand criteria

Readability criteria were least consistently met (Table 2). Overall, ADA brochures achieved lower reading grade levels; five brochures had an overall reading grade level that met the consensus recommendation of ≤5th grade. Wide ranges of required literacy were found within all brochures, however, with sentences reaching grade levels as high as 23.5 for ADA materials and 24.6 for AHA materials (surpassing postdoctoral education), impacting consistency of readability. Font size reduced ease of reading and vision accessibility. Use of multisyllabic or less common words (e.g., quivering, prone, vitally, overexertion, predisposes, gorge, and translucent), technical terms that were often not sufficiently explained (e.g., the explanation for PCBs was polychlorinated biphenyls), and inclusion of significant amounts of excess information nonessential to the purpose of the brochure also contributed to poor reading ease in brochures with low readability.

Unmet behavioral activation criteria

Criteria least often met were devotion of ≥50% of content to recommended behaviors and provision of step-by-step instructions to enable readers to enact recommended behaviors. When interactive activities were included, such as checklists and fill-in blanks to keep a record, small size of the activity logs/records often limited ease or practicality of use. Assessment of audience relevance and appropriateness criteria identified factors that might limit generalizability to low–health-literate and underserved audiences. Underlying assumptions were observed with regard to nutrition knowledge (e.g., "choose fats with two g or less saturated fat per tablespoon," "be moderate in use of refined foods containing sugar"), availability of recommended foods (e.g., "keep fresh, low-fat foods around," "enjoy fat-free and low-fat cheeses and other dairy products," and "buy fresh fruits and vegetables"), access to specialty products (e.g., cholesterol-lowering margarine or "butter-flavored granules" as a butter/margarine substitute), and financial resources (e.g., recommendations to use choice cuts of meat and use a food processor). With regard to physical activity recommendations, underlying assumptions included existing exercise knowledge (e.g., "do 10 to 15 repetitions without resistance," and the explanation that exercise will "maintain basal metabolic rate"), access to specialty recreation facilities (e.g., tennis courts, swimming pool for lap swimming, and hiking locations), and resource availability (e.g., models depicted wearing specialty exercise gear or sporting wear). These observable characteristics may not be perceived by underserved patients as representative of their experiences, environments, or resources.

CONCLUSIONS — Although the evaluated materials may be suitable for patients with adequate to proficient literacy and health literacy, there remains room for improvement in design of materials to meet the needs of patients with low literacy; low health literacy; vision difficulties; low prior medical, nutrition, and exercise knowledge; limited access to resources for fresh or specialty health foods; and limited access to resources for structured sporting and exercise facilities and activities. Unfortunately, these factors characterize underserved populations who have high rates of the diseases addressed in the education materials (9).

Concerted efforts to maximize the reach and effectiveness of print education materials, using available criteria, are warranted. Individuals with lower health literacy identify brochures or books as a primary source from which they receive health information (5), and print materials have proven effective as an intervention tool (10–12). Moreover, although auditory presentation of information is often recommended as a nonprint strategy to use with low-literacy patients, drawbacks include the associations of lower education and lower literacy with reduced auditory information processing and verbal memory (13,14). Supplementing discussion with printed information may improve understanding of health instructions (15) and processing of information for medical decision making (16).

A potential limitation is that the materials evaluated in the current study were obtained from the ADA and AHA Web sites, and patients with low health literacy may be less able or less likely to

Table 1—*Consensus criteria for evaluation of literacy-demand (n = 23) and behavioral activation (n = 9) characteristics of print patient education materials*

Criteria literacy demand	Specifications	Sources (refs.)*
Word usage, reading level, and sentence length	Scientific jargon avoided; technical, concept, category, and value judgment terms introduced with understandable explanation or example	6–8
	Vocabulary uses common words; multisyllabic words (>2–3 syllables) avoided	6–8
	Sentence length <15 words	6, 7
	Writing in active (vs. passive) voice	7, 8
	Reading grade level <5th grade*	7, 8
Typography	Text in uppercase and lowercase serif (best) or sans-serif	6–8
	Type size ≥12 points (including text, tables, and captions)	6–8
	Typographic cues (bolding, bullets, and size) emphasize key points	6–8
	Subheaders used; complex topics subdivided into smaller parts of ≤5 main points, ≤5 items per list†	6, 7
	Line length ≤30–50 characters and spaces	7, 8
	Using all capital letters for long headers or running text avoided	7, 8
Graphics, illustrations, and tables	Cover graphic shows purpose of brochure, attracts attention, and is friendly	6–8
	Graphics designed to be simple, age appropriate, and familiar to readers	6–8
	Explanatory captions included with each graphic	6–8
	Illustrations on page adjacent to related text	6, 7
	Illustrations present key messages so that reader can grasp key idea from illustration alone	6, 7
	Illustrations not distracting	7, 8
Layout, space, and paper	Layout and organization enable predicable sequence/flow of information	6–8
	Visual cuing devices (e.g. shading, boxes, arrows) used to direct attention to specific points or key content	6–8
	Adequate white space and line spacing used to reduce appearance of clutter	6–8
	Contrast between type and paper is high	6–8
	Color use supports and does not distract from message. Readers need not learn color codes to understand and use message	7, 8
	Topics preceded by advanced organizers or headers >50% of the time	7, 8
Behavioral activation		
Content, scope, and organization	Scope limited to information directly related to purpose‡	6–8
	Content ≥50% behaviorally focused	7, 8
	Summary, information overview, or information review included	7, 8
Engagement, interaction, and action facilitation	Recommended behaviors are modeled and specific (e.g. step by step)	6–8
	Questions or activities with records presented for reader response	7, 8
	"How to" information provided	6, 8
Audience relevance and appropriateness	Recommendations sensible in the context of the audience's culture, values, and beliefs	6–8
	Language and experience(s) used match those of the intended audience	6–8
	Cultural images and examples presented in a positive manner	6–8

Literacy demand, $n = 23$; behavioral activation, $n = 9$. *5th-grade reading level or less is the superior criterion according to Doak et al. (6) and the recommended criterion for low literacy according to the National Cancer Institute (8). †No more than three to four main ideas and five to six items per list according to Centers for Disease Control (7) criteria; less than seven main ideas and three to five items per list for low literacy according to Doak et al. criteria (6). ‡A less stringent, adequate criterion according to Doak et al. is that <40% of information be nonessential to purpose.

access these Web sites. Although the study procedure used the Web sites to ensure that all titles were identified and perused by the investigators, it is important to note that the ADA materials are designed as a "toolkit" for healthcare professionals, with specific instructions on the Web site for professionals to print out the brochures to give to their patients. Similarly, AHA materials are hard copy brochures that are made available in clinical and community settings, where patients of all literacy levels encounter them. A second limitation is that several of the AHA titles found on the Web site and requested from AHA were not received. Although these primarily reflected discontinued materials

Table 2—*Selected literacy-demand evaluation results for diabetes and CVD print patient education materials*

Patient education brochures	Flesch-Kincaid reading grade level*		Text font size†	Number of words per sentence‡	Number of characters per line§
	Brochure grade level	Grade level by sentence			
ADA¶					
Treating High Cholesterol in People with Diabetes	4.3	2.3–14.2	10–12	6–26	37–135
Protect Your Heart: Choose Fats Wisely	4.4	0.0–20.9	10–12	6–23	25–138
Learning How to Change Habits	4.8	0.0–7.9	11.5–12	5–19	20–93
Protect Your Heart: Check Food Labels to Make Heart-Healthy Choices	4.9	0.0–14.6	10–12	5–36	26–157
Protect Your Heart: Cook with Heart-Healthy Foods	5.0	0.0–11.1	12	4–25	21–156
Taking Aspirin to Protect Your Heart	5.2	0.5–11.9	10–12	8–25	34–114
Treating High Blood Pressure in People with Diabetes	5.2	2.6–17.2	10–12	4–33	24–182
All About Carbohydrate Counting	5.6	2.2–15.0	10–12	8–35	30–118
Protect Your Heart by Losing Weight	5.8	0.0–12.5	12	3–25	20–151
All About Blood Glucose for People with Type 2 Diabetes	6.5	1.0–17.6	10–12	9–35	46–215
All About Peripheral Arterial Disease	7.0	0.0–15.7	10–12	4–33	12–173
Taking Care of Your Heart	7.1	0.0–14.7	12	5–24	31–145
Taking Care of Type 2 Diabetes	7.6	0.5–14.5	10–12	5–23	29–170
All About Physical Activity for People with Diabetes	7.7	0.0–15.4	12	3–29	21–63
Knowing the Warning Signs of a Heart Attack	7.8	4.7–13	10–12	11–30	46–135
Getting Started with Physical Activity	8.2	2.6–15.7	11.5–12	7–40	43–185
Getting the Very Best Care for Your Diabetes	8.3	0.0–15.0	10–12	9–31	52–165
Protect Your Heart: Make Wise Food Choices	8.3	0.0–15.4	12	5–29	33–178
All About Insulin Resistance	8.5	0.0–16.9	12	6–43	29–227
All About Stroke	9.0	0.0–17.6	10–12	4–27	12–158
Medical Tests and Procedures for Finding and Treating Heart and Blood Vessel Disease	11.9	3.9–23.5	12	9–41	47–210
AHA‖					
Managing Your Weight	6.3	0.0–16.3	9–12	6–23	35–141
Just Move!	6.7	2.3–15.4	9–12	2–29	18–165
Easy Food Tips for Heart-Healthy Eating	6.8	0.0–14.9	9–12	3–37	21–208
Understanding and Controlling Your High Blood Pressure	7.1	0.0–13	9–12	5–26	35–116
Tips for Eating Out	7.3	0.8–11.5	9–12	8–41	31–186
Smoking and Your Risk of Stroke	7.3	0.0–24.6	9–12	3–50	15–336
High Blood Pressure	7.8	3.3–20.6	9–12	4–30	25–182
High Blood Pressure in African Americans	7.9	0.0–18.5	9–12	6–33	31–187
Diabetes, Heart Disease & Stroke	8.0	0.5–17.9	9–12	3–27	22–155
Six Steps to A Healthy Heart	8.0	2.2–17.5	9–12	6–38	34–165
Are You At Risk Of Heart Attack Or Stroke	8.3	2.4–16.7	9–12	9–31	54–169
Controlling Your Risk Factors	8.3	0.1–19.8	12	6–27	42–180
Understanding Stroke	8.6	0.0–15.4	9–12	3–22	17–120
Shaking Your Salt Habit	8.9	0.5–15.8	9–12	5–25	28–146
An Eating Plan for Healthy Americans	9.0	0.6–20.4	9–12	4–32	28–183
Exercise and Your Heart	9.1	0.0–23.1	9–12	3–43	16–303
Stroke: Are You at Risk	9.7	0.6–19.8	9–12	7–39	29–216
About Your Peripheral Artery Disease	10.1	2.4–17.6	9–12	5–30	33–139
Aspirin, Heart Disease & Stroke	10.1	0.5–18.4	9–12	4–30	22–156

Data are means or ranges. *Recommendation is <5th grade (refs. 7 and 8). †Recommendation is ≥12 points (refs. 6–8). ‡Recommendation is <15 words (refs. 6 and 7). §Recommendation is <50 characters per line (refs. 7 and 8). ¶$n = 21$. ‖$n = 19$.

and changes to titles produced that had not yet been updated on the Web site, it is possible that some materials may have been unavailable as a result of such frequent request that they become out of stock. To the extent that we were not able to access some materials that may be used currently, it is possible that some titles are not represented in the current evaluation.

Development of such materials in the future would benefit from inclusion of experts in medical content, behavior change, education and literacy, and graphics/design. Moreover, patient feed-

back and empirical evaluation of accessibility, effectiveness, and most important criteria for optimal usability are essential (3).

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