Health Literacy and Complementary and Alternative Medicine Use Among Underserved Inpatients in a Safety Net Hospital

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Little is known about the relationship between health literacy and complementary and alternative medicine (CAM) use in low-income racially diverse patients. The authors conducted a secondary analysis of baseline data from 581 participants enrolled in the Re-Engineered Discharge clinical trial. The authors assessed sociodemographic characteristics, CAM use, and health literacy. They used bivariate and multivariate logistic regression to test the association of health literacy with four patterns of CAM use. Of the 581 participants, 50% reported using any CAM, 28% used provider-delivered CAM therapies, 27% used relaxation techniques, and 21% used herbal medicine. Of those with higher health literacy, 55% used CAM. Although there was no association between health literacy and CAM use for non-Hispanic Black participants, non-Hispanic White (OR = 3.68, 95% CI [1.27, 9.99]) and Hispanic/other

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The National Center for Complementary and Alternative Medicine (2011) defines *complementary and alternative medicine* (CAM) as “a group of diverse medical and health systems, therapies, and products that are not presently considered to be part of conventional medicine.” According to the National Health Interview Survey (NHIS), 38% of the U.S. population uses CAM; including 26% of African Americans, 28% of Hispanics, and 36% of non-Hispanic Whites (Barnes, Bloom, & Nahin, 2008). Although evidence demonstrates CAM use among minority patients (Barner, Bohman, Brown, & Richards, 2010; Smith, Smith, & Ryan, 2008), facilitators and barriers (e.g., access and out-of-pocket expenses) to the use of CAM among minority hospitalized patients requires further investigation (Decker et al., 2007).

Limited health literacy affects 36% of Americans and disproportionately affects minority groups (Kutner, Greenberg, Jin, & Paulsen, 2006). *Health literacy* is defined as the degree to which individuals possess the capacity to obtain, process, and understand health information and services that are needed to make informed health decisions and take informed actions (Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005). Low health literacy is associated with worse self-reported health status, higher health care costs, more frequent use of health services, hospitalization, and death (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011).

Knowing the relationship between health literacy and CAM may help (a) health providers determine which patients are more likely to use CAM, (b) health providers understand how patients of varying health literacy levels relate to allopathic care, (c) direct educational interventions related to CAM, and (d) researchers design CAM clinical trials that take into account the health literacy of participants.

Several studies examined health literacy as a predictor of CAM use. Bains and Egede (2011) reported adequate health literacy was associated with increased CAM use among Whites but not among African Americans. Owen-Smith, McCarty, Hankerson-Dyson, and Diclemente (2012) reported that participants with higher health literacy were more likely to use CAM than were those with low health literacy among African Americans with AIDS. Our study aimed to explore the role of race and health literacy in the use of CAM and to determine the prevalence of four subsets of CAM: (a) any CAM use, (b) use of provider-delivered CAM (e.g., acupuncture, massage, or chiropractic), (c) herbal medicine, and (d) use of relaxation therapies with underserved hospitalized patients.

**Method**

The data for this analysis were extracted from the Re-Engineered Discharge randomized-controlled trials, an intervention designed to reduce readmission at Boston Medical Center, an inner-city hospital (Jack et al., 2009). Self-reported baseline data was collected when patients enrolled in the study.

**Sociodemographic and Clinical Variables**

Sociodemographic and clinical characteristics included at baseline were age, sex, race, education, income, employment, insurance, having a primary care provider, being
born in the United States, English as one’s primary language, and depressive symp-
toms as measured by the nine-item Patient Health Questionnaire (Kroenke, Spitzer, &
Williams, 2001).

**Primary Independent Variable**

The Rapid Estimate of Adult Literacy in Medicine (REALM) measures health literacy
by using a medical word pronunciation test consisting of 66 medical terms, arranged
in order of complexity by the number of syllables and pronunciation difficulty. The
REALM has high criterion validity and test–retest reliability (0.99; \( p < .001 \); Davis
et al., 1993). The REALM score assigns health literacy skills by grade level, clustering
four grade levels into two categories: low (score of less than 60) health literacy and
high (score of 60 or more) health literacy (Bhat et al., 2012; Green et al., 2011). Sub-
jects unable to take the REALM \( (n = 42) \) were excluded from the analyses.

**Outcome Variables**

The four outcome variables were (a) use of any CAM, (b) use of provider-delivered
CAM therapies, (c) use of relaxation and mind/body techniques, and (d) use of herbal
supplements. We did not include use of vitamins or minerals.

**Statistical Analysis**

Of the 802 participants in the Re-Engineered Discharge studies, 581 provided data for
both the CAM questions and the REALM and were included in these analyses. First,
we compared participant characteristics by high versus low health literacy, assessing
crude associations between certain characteristics of the participants and their use of
CAM. Effect modification of the association between health literacy and the outcomes
was tested. Motivated by earlier results from Bains and Egede (2011), we tested for an
interaction between health literacy and race for use of any CAM. The Breslow-Day
test for interaction indicated that there was a significant interaction between health
literacy and race \( (p = .03) \) for any CAM use. We assessed the crude association between
CAM use and health literacy in racial strata. We used multivariate logistic regression
models for each outcome, testing the association with health literacy, adjusting for
sociodemographic and clinical participant characteristics.

Because the educational variable was found to be highly associated with health
literacy level \( (p < .01) \), we considered models both with, and without, education; all
results for the models with both education and health literacy were comparable to
results for models without education; therefore we report results from models that
exclude education. We used SAS 9.1 for all analyses (SAS Institute Inc., Cary, NC).

**Results**

The analyses included data from 581 individuals, of whom 38% had low health liter-
acy. Regarding race, 52% self-identified as non-Hispanic Black, 29% as non-Hispanic
White, and 19% as Hispanic/other race. High health literacy was associated with race,
higher education, higher income, being employed, being born in the United States, and
having English as one’s primary language (see Table 1). In addition, 50% reported any
CAM use, 28% reported provider-delivered therapies use, 22% used herbal medicine,
| Characteristics                  | Low health literacy | Higher health literacy | Chi-square test (p) |
|---------------------------------|---------------------|------------------------|---------------------|
|                                 | n (%) (n = 222)     | n (%) (n = 359)        |                     |
| **Age (years)**                 |                     |                        | .18                 |
| 18–29                           | 20 (33.9)           | 39 (66.1)              |                     |
| 30–39                           | 22 (31.0)           | 49 (69.0)              |                     |
| 40–49                           | 61 (35.1)           | 113 (64.9)             |                     |
| 50–59                           | 63 (40.9)           | 91 (59.1)              |                     |
| >60                             | 56 (45.9)           | 66 (54.1)              |                     |
| **Sex**                         |                     |                        | .08                 |
| Male                            | 116 (42.0)          | 160 (58.0)             |                     |
| Female                          | 106 (34.9)          | 198 (66.0)             |                     |
| **Race**                        |                     |                        | <.01                |
| Non-Hispanic White              | 27 (16.0)           | 142 (84.0)             |                     |
| Non-Hispanic Black              | 143 (47.7)          | 157 (52.3)             |                     |
| Hispanic/other race<sup>a</sup> | 48 (44.4)           | 60 (55.6)              |                     |
| **Education**                   |                     |                        | <.01                |
| Less than eighth grade          | 20 (71.4)           | 8 (28.6)               |                     |
| Incomplete high school          | 54 (60.7)           | 35 (39.3)              |                     |
| High school degree or equivalent| 95 (45.0)           | 116 (55.0)             |                     |
| College                         | 46 (19.1)           | 195 (80.9)             |                     |
| **Income**                      |                     |                        | <.01                |
| None to <$10,000                | 105 (47.1)          | 118 (52.9)             |                     |
| $10,001 to $30,000              | 81 (40.1)           | 121 (59.9)             |                     |
| $30,001 to $50,000              | 23 (31.9)           | 49 (68.1)              |                     |
| $50,000 or greater              | 10 (18.5)           | 44 (81.5)              |                     |
| Other (missing/refused)         | 3 (10.0)            | 27 (90.0)              |                     |
| **Employment status**           |                     |                        | <.01                |
| Employed                        | 49 (27.5)           | 129 (72.5)             |                     |
| Unemployed                      | 71 (43.8)           | 91 (56.2)              |                     |
| Retired                         | 35 (42.2)           | 48 (57.8)              |                     |
| Disabled                        | 67 (42.4)           | 91 (57.6)              |                     |
| **Insurance**                   |                     |                        | <.01                |
| Private                         | 60 (31.8)           | 129 (68.3)             |                     |
| Government/free                 | 146 (42.6)          | 197 (57.4)             |                     |
| None                            | 12 (26.7)           | 33 (73.3)              |                     |
| **Has primary care provider**   |                     |                        | .82                 |
| Yes                             | 182 (38.0)          | 297 (62.0)             |                     |
| No                              | 40 (39.2)           | 62 (60.8)              |                     |
| **Born in the United States**   |                     |                        | <.01                |
| Yes                             | 156 (34.4)          | 297 (65.6)             |                     |
| No                              | 66 (52.6)           | 62 (48.4)              |                     |
| **English primary language**    |                     |                        | <.01                |
| Yes                             | 186 (36.1)          | 329 (63.9)             |                     |
and 27% used relaxation techniques. Of CAM users, 68% had higher health literacy, and 56% of the non-CAM users had higher health literacy. In the model unadjusted for sociodemographic and clinical participant characteristics, we found that among Hispanic/other race participants, any CAM use ($p = .04$) and provider-delivered therapies ($p = .04$) were statistically significant. We also found statistical significance among non-Hispanic Whites for any CAM use ($p < .01$) and relaxation techniques ($p < .01$).

In our adjusted multivariate analysis, we found a significant interaction between race and health literacy for any CAM use and for provider-delivered therapies (see Table 2). Use of any CAM among non-Hispanic White or Hispanic/other race participants was significantly higher among those with higher health literacy (OR 3.68, 95% CI [1.27, 9.99] and OR 3.40, 95% CI [1.46, 7.91], respectively). Individuals identifying as Hispanic/other race with higher health literacy were more likely to use provider-delivered therapies compared with those with low health literacy (OR 3.59, 95% CI [1.27, 10.19]). No racial or ethnic distinctions were evident in the relationship between health literacy and use of herbs. Use of relaxation techniques was significantly more common among those with higher health literacy regardless of race and ethnicity.

### Table 1. Continued

| Characteristics | Low health literacy $n$ (%) ($n = 222$) | Higher health literacy $n$ (%) ($n = 359$) | Chi-square test ($p$) |
|-----------------|----------------------------------------|-------------------------------------------|-----------------------|
| No Depression   | 32 (52.5)                              | 29 (47.5)                                 | .41                   |
| Depression status (Patient Health Questionnaire-9) | | | |
| Severe depression | 31 (44.9)                              | 38 (55.1)                                 |                       |
| Mild depression  | 11 (42.3)                              | 15 (57.7)                                 |                       |
| No depression    | 178 (37.0)                             | 303 (63.0)                                |                       |

*Note. Low health literacy = Rapid Estimate of Adult Literacy in Medicine (REALM) score of less than 60; high health literacy = REALM score of 60 or greater.

“Other” refers to Asian/Pacific Islanders and American Indians.

### Discussion

This article adds new information on CAM use among a diverse population of low-income hospitalized patients. We found that higher health literacy was associated with more use of any CAM and provider-delivered CAM therapies for all groups other than non-Hispanic Blacks. In addition, those with higher health literacy were three times more likely to use relaxation techniques compared with those with low health literacy, regardless of race or ethnicity.

Our findings related to race and ethnicity and their relationship with health literacy are similar to two past studies (Bains & Egede, 2011; Owen-Smith et al., 2012). However, we also found that those with higher health literacy were more likely to use relaxation techniques compared with those with low health literacy, regardless of race and ethnicity. The reason for this discrepancy is unclear. Clinical studies have demonstrated a positive effect of relaxation techniques on certain medical conditions such as pain and depression. More research, by experts in health literacy, is needed to
Table 2. Adjusted multivariate logistic regression of factors associated with CAM use, provider-delivered therapy, herbal medicine, and relaxation technique use

| Characteristics          | Any CAM use | Only provider-delivered therapies | Only herbal medicine | Only relaxation techniques |
|--------------------------|-------------|----------------------------------|----------------------|---------------------------|
| Non-Hispanic Black       |             |                                  |                      |                           |
| Low health literacy      | 1           | 1                                | 1                    | 1                         |
| Higher health literacy   | 1.24 (0.76, 2.02) | 0.90 (0.52, 1.56) | 1.23 (0.68, 2.23) | 2.59 (1.39, 4.85)       |
| Non-Hispanic White       |             |                                  |                      |                           |
| Low health literacy      | 1           | 1                                | 1                    | 1                         |
| Higher health literacy   | 3.68 (1.27, 9.99) | 1.22 (0.46, 3.25) | 2.77 (0.74, 10.31) | 3.78 (1.33, 10.73)       |
| Hispanic/other race      |             |                                  |                      |                           |
| Low health literacy      | 1           | 1                                | 1                    | 1                         |
| Higher health literacy   | 3.40 (1.46, 7.91) | 3.59 (1.27, 10.19) | 1.47 (0.55, 3.92) | 3.37 (1.09, 10.39)       |

Note. Adjusted for age, gender, employment status, income, insurance, primary care provider, depression, and birth in the United States. CAM = complementary and alternative medicine.
understand the barriers of low health literacy patients to relaxation techniques. Last, health literacy experts should explore whether current CAM modalities and clinical services are accessible to low health literacy patients, and if not, how to design relaxation interventions to be more appropriate for low health literacy patients.

Our study has several limitations. Because the Re-Engineered Discharge trials included only English-speaking patients, we do not know whether our results would hold for non–English-speaking patients. We also did not have a sufficient numbers of participants to explore differences between Hispanic, Asian, and American Indian patients. Furthermore, the REALM tool carries limitations. REALM does not assess a participant’s understanding of words. It also has a narrow focus on word recognition, pronunciation, and has not been validated across health areas (Consumer Health Informatics Research Resource, 2013).

As national CAM research moves forward, it is necessary to study modalities among underserved populations, particularly those with low health literacy.

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