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Health Literacy Among Medically Underserved: The Role of Demographic Factors, Social Influence, and Religious Beliefs

Shannon M. Christy[1,2,3], **Clement K. Gwede**[1,2], **Steven K. Sutton**[1,2], **Enmanuel Chavarria**[4], **Stacy N. Davis**[5], **Rania Abdulla**[1], **Chitra Ravindra**[6], **Ida Schultz**[7], **Richard Roetzheim**[1,2], and **Cathy D. Meade**[1,2]

[1]Division of Population Science, H. Lee Moffitt Cancer Center & Research Institute, Tampa, Florida, USA

[2]Morsani College of Medicine, University of South Florida, Tampa, Florida, USA

[3]Department of Psychology, Indiana University-Purdue University Indianapolis, Indianapolis, Indiana, USA

[4]University of Texas Health Science Center at Houston, School of Public Health, Department of Health Promotion and Behavioral Sciences, Brownsville, Texas, USA

[5]Health Education and Behavioral Science, Rutgers School of Public Health, Piscataway, New Jersey, USA

[6]Florida Department of Health Pinellas County, St. Petersburg, Florida, USA

[7]Premier Community HealthCare Group, Inc., Dade City, Florida, USA

Abstract

The current study examined the sociodemographic and psychosocial variables that predicted being at risk for low health literacy among a population of racially and ethnically diverse patients accessing primary care services at community-based clinics. Participants (*N*=416) were aged 50–75, currently not up-to-date with colorectal cancer (CRC) screening, at average CRC risk, and enrolled in a randomized controlled trial aimed at promoting CRC screening. Participants completed a baseline interview that assessed health literacy as measured by Rapid Estimate of Adult Literacy in Medicine-Revised, sociodemographic factors, and psychosocial variables (e.g., health beliefs) prior to randomization and receipt of an intervention. Thirty-six percent of participants were found to be at risk for low health literacy. Sociodemographic and psychosocial variables were assessed as predictors of being at risk for low health literacy using logistic regression. In the final model, predictors were male gender, being from a racial/ethnic minority group, being unable to work, having higher social influence scores, and having higher religious belief scores. These findings suggest several patient characteristics that may be associated with low health literacy, and highlight the importance of supporting all patients through simplified and clear communications and information to improve understanding of CRC screening information.

Address correspondence to Shannon M. Christy, Division of Population Science, H. Lee Moffitt Cancer Center and Research Institute, 12902 Magnolia Drive, MFC-EDU, Tampa, FL 33612, USA., Shannon.Christy@moffitt.org, Telephone: (813) 745-8385.

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Health literacy involves a constellation and complex set of skills that facilitate people's ability to use and act on information and adopt healthy behaviors (U.S. Department of Health and Human Services, 2010). Health literacy has been found to impact health status (Hoover et al., 2015; Sentell, Baker, Onaka, & Braun, 2011), medical decision-making (Wang et al., 2014), access to care (Levy & Janke, 2016), completion of positive health behaviors such as cancer screening (Fernandez, Larson, & Zikmund-Fisher, 2016; Heberer et al., 2016), and health outcomes (Scarpato et al., 2016). For example, individuals with inadequate self-reported health literacy have been found less likely to be adherent to mammography guidelines and to report regular moderate physical activity than those with adequate self-reported health literacy (Fernandez, Larson, & Zikmund-Fisher, 2016). In addition, health literacy has been positively associated with cancer knowledge and inversely associated with cancer fatalism (Brittain, Christy, & Rawl, 2016; Morris et al., 2013). Specific demographic factors that have been associated with being at risk for low health literacy include identifying as an individual from a racial/ethnic minority group, older age, lower educational attainment, lower household income, being a non-native English speaker, and recently immigrating to the United States (U.S. Department of Health and Human Services, 2010). In addition, self-reported health literacy has been associated with perceived control over one's health and perceived social standing (Fernandez, Larson, & Zikmund-Fisher, 2016).

The importance of health literacy in promoting safer, more effective health outcomes resulted in the naming of specific topics, goals, and objectives in Healthy People 2020, which provides direction for how health communications can positively impact health behaviors, health care, and health equity (U.S. Department of Health and Human Services, 2014). Yet, limited research has been conducted in community-based settings among the medically-underserved to understand the prevalence of health literacy and the sociodemographic and psychosocial variables that predict being at risk for low health literacy. As such, this study may help to elucidate factors that would contribute to personalized communications that convey colorectal cancer (CRC) screening information.

Among men and women, CRC is the third most common cancer type and second leading cause of cancer mortality in the United States (American Cancer Society, 2017). CRC screening allows for both early detection and prevention of CRC (American Cancer Society, 2017). There are multiple CRC screening test modalities and these tests often include oral and written instructions for test preparation and test result explanations. CRC information requires a wide range of literacy skills that cover basic concepts of health to more advanced concepts of risk probability and statistics (Schapira et al., 2014). Low health literacy has been found to be a barrier to CRC screening in prior research (Kobayashi, Wardle, & von Wagner, 2014; Shelton, Jandorf, Ellison, Villagra, & DuHamel, 2011) and is associated with less CRC awareness, CRC test knowledge, CRC screening test efficacy, and negative attitudes toward fecal occult blood test [FOBT] (Arnold et al., 2012; Dolan et al., 2004). In addition, low health literacy has been associated with less confidence in obtaining a stool blood test and CRC screening completion (Arnold et al., 2012). Importantly, identifying those characteristics which may be useful in constructing actionable and relatable communications for cancer prevention can contribute highly to meeting national CRC screening benchmarks of 80% (National Colorectal Cancer Roundtable, 2015).

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Given the CRC cancer health disparities that exist (i.e., CRC incidence, mortality, and screening rates) (American Cancer Society, 2017), it is vital that we understand health literacy among age-appropriate, racially and ethnically-diverse individuals accessing community clinics such as federally-qualified health clinics (FQHCs) or county department of health clinics so that we can develop effective interventions to promote CRC screening among the medically-underserved. For example, prior studies conducted among FQHC patients in Louisiana found that between 52%−54% of participants had literacy skills at less than 9th grade level (Arnold et al., 2012; Arnold, Rademake, Liu, & Davis, 2017). Understanding relationships between health literacy and sociodemographic and psychosocial factors may help identify individuals at risk for low health literacy as well as help us to effectively target materials for individuals at risk for low health literacy receiving services in community clinics.

In the current study, we sought to describe health literacy among a population of racially and ethnically diverse patients seeking primary care services at community clinics and to identify sociodemographic (e.g., demographic and healthcare experiences) and psychosocial (e.g., health beliefs regarding CRC and CRC screening, trust in the healthcare system, perceived discrimination) variables that predicted being at risk for low health literacy among these patients. We utilized baseline data from a randomized controlled trial based upon a Preventive Health Model (PHM) framework, which has been shown to be relevant to CRC screening behavior in prior studies (McQueen, Tiro, & Vernon, 2008; Myers et al., 1994; Myers et al., 2007; Tiro, Vernon, Hyslop, & Myers, 2005; Vernon, Myers, & Tilley, 1997; Vernon, Myers, Tilley, & Li, 2001). Thus, we examined the relationships between health literacy and PHM variables, as well as other demographic and psychosocial variables that might be relevant to both CRC screening and health literacy in a diverse population. Study analyses were guided by the following research questions:

1. What is the prevalence of different health literacy score levels among patients receiving care in community-based clinics?
2. What are the sociodemographic and psychosocial predictors of being at risk for low health literacy among this racially and ethnically diverse population of patients?

Methods

Procedures

This is a cross-sectional study based upon baseline data from a parent randomized controlled trial (RCT) called Colorectal Cancer Awareness, Research, Education, and Screening (CARES) (Davis et al., 2016). The trial aimed to assess the efficacy of a low-literacy, targeted educational CRC screening intervention (photonovella, DVD, and fecal immunochemical test [FIT] kit) informed by the Preventive Health Model (PHM) compared to a non-targeted Centers for Disease Control and Prevention brochure plus FIT kit to promote CRC screening among adults non-adherent to CRC screening guidelines. Study procedures have been described in detail previously (Davis et al., 2016). Briefly, participants were patients receiving primary care services in a community clinic (one of two federally-

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qualified healthcare centers [FQHCs] or a county Department of Health clinic). The study was completed within the context of the Tampa Bay Community Cancer Network, a community-academic partnership between 28 community organizations and an National Cancer Institute-designated comprehensive cancer center, which was formed to reduce health disparities in the Tampa Bay area (Meade, Menard, Luque, Martinez-Tyson, & Gwede, 2011; Simmons et al., 2015). With the guidance of a community advisory committee, the low-literacy CRC education materials (photonovella and DVD) were developed according to principles of plain language and clear communication using a series of systematic pretesting steps (Doak, Doak, & Root, 1996; U.S. Department of Health and Human Services, 2008).

Informed consent was obtained from eligible participants prior to a baseline interview. The interview required 30–45 minutes to complete and was conducted verbally by a trained research coordinator. Participants received a $10 gift card after completing the baseline interview. Baseline data collection was completed between July 2012 and 2014 and occurred prior to randomization to intervention group and intervention delivery. Of 497 individuals who were eligible to participate, 416 individuals were enrolled and randomized (an additional 4 individuals were enrolled, but not randomized and are not included in analyses) (Davis et al., 2016).

Eligibility and Study Participants

The University of South Florida and Florida Department of Health Institutional Review Boards approved the study procedures (Davis et al., 2016). Participants were eligible for the study if they met the following criteria: 1) between 50–75 years of age; 2) receiving care at one of the three participating community health clinics; 3) currently not up-to-date with CRC screening guidelines; 4) at average risk for CRC (i.e., no symptoms of CRC, no personal diagnosis of CRC or bowel diseases, no strong family history of CRC); and 5) able to speak and read English (Davis et al., 2016).

Measures

Health literacy.—The revised version of the Rapid Estimate of Adult Literacy in Medicine (REALM), the REALM-R, was utilized to measure health literacy (Bass, Wilson, & Griffith, 2003; Davis et al., 1993). This tool contains a list of 11 health-related terms and subjects were asked to read and pronounce them. Only the last 8 items are scored, with 1 point given for each item pronounced correctly from the list (Bass et al., 2003; Davis et al., 1993). Individuals with a score of 6 or less are considered to be at risk for low health literacy. The REALM-R has been found to have good internal consistency and validity (Bass et al., 2003; Davis et al., 1993).

PHM variables.—PHM health belief constructs were assessed using a 5-point Likert scale ranging from strongly disagree=1 to strongly agree=5 (McQueen, Vernon, Meissner, & Rakowski, 2008; Myers et al., 2007; Tiro, Vernon, Hyslop, & Myers, 2005; Vernon, Myers, Tilley, & Li, 2001). Three items assessed *perceived susceptibility*, or the participant's beliefs about their chances of developing CRC and/or polyps (McQueen et al., 2008; Myers et al., 2007; Tiro et al., 2005; Vernon et al., 2001). Six items measured *self-efficacy,* or the

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participant's confidence in their ability to successfully collect a stool sample (McQueen et al., 2008; Myers et al., 2007; Tiro et al., 2005; Vernon et al., 2001). Four items assessed *salience and coherence*, or the participant's beliefs about whether CRC screening was important for maintaining health and made sense in their life (McQueen et al., 2008; Myers et al., 2007; Tiro et al., 2005; Vernon et al., 2001). Two items assessed *response efficacy*, or beliefs about whether early-stage CRC can be cured and whether polyp removal can prevent CRC (McQueen et al., 2008; Myers et al., 2007; Tiro et al., 2005; Vernon et al., 2001). Four items assessed *social influence*, a participant's perceptions of what their family members and health care providers think about the participant having a CRC screening test and a participant's desire to comply with the important others' CRC screening attitudes (McQueen et al., 2008; Myers et al., 2007; Tiro et al., 2005; Vernon et al., 2001). *Cancer worry* was measured with two items about the participant's concerns about having a positive CRC screening result (McQueen et al., 2008; Myers et al., 2007; Tiro et al., 2005; Vernon et al., 2001). Five items measured *religious beliefs*, or the extent to which religious beliefs influence one's health behaviors (Myers, personal communication, 2011).

Awareness.—Twelve items measured awareness of CRC and CRC screening, including three yes-no items adapted from the Health Information National Trends Survey (National Cancer Institute, 2009) that assessed whether participants had previously heard of stool blood test, sigmoidoscopy, and colonoscopy and nine items that further assessed CRC and CRC screening knowledge (Christy et al., 2016; Davis et al., 2016). A total awareness score was calculated by summing the points earned for all 12 items.

Decisional conflict.—Nine items assessed the amount of difficulty a participant had in making CRC screening-related decisions (O'Connor, 1995; O'Connor, 2003). Response options on a 5-point scale ranged from strongly agree = 1 to strongly disagree = 5, with higher scores indicating more decision-making conflict.

Cancer fatalism.—Fifteen items measured the extent to which a participant believes that death is inevitable when cancer is present (Powe, 1994, 1995, 1996). Participants respond either "yes" or "no," with 1 point is added for each "yes" response. After summing responses, lower scores indicate lower levels of fatalism.

Perceived discrimination.—The frequency of experiences of mistreatment in healthcare experiences as well as daily life were assessed with 8 items (Kessler, Mickelson, & Williams, 1999; Williams, Yan, Jackson, & Anderson, 1997). Items were rated as never = 1, rarely = 2, sometimes = 3, and often = 4. Higher scores indicate perception of more frequent discrimination.

Trust in healthcare system.—Ten items assessed opinions about the trustworthiness of the health care system, hospitals, health insurance companies, and medical research (Rose, Peters, Shea, & Armstrong, 2004). Response options ranged from strongly disagree = 1 to strongly agree = 5, with higher scores indicating greater distrust.

Sociodemographic variables.—Participants responded to items regarding their age, gender, race, marital status, employment status, education level, household income, health

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insurance status, place of birth (U.S. vs. outside of U.S.), birthplace of their parents (U.S. vs. outside of U.S.), whether they had a regular healthcare provider, and had ever previously completed CRC screening.

Statistical analysis

Statistical analyses were conducted using SAS software (version 9.4 [TS1M1], 2012, SAS Institute Inc., Cary, NC). First, descriptive statistics were computed for all sociodemographic and psychosocial factors. Race and ethnicity were combined for the study analyses, resulting in two categories: White, non-Hispanic vs. Racial/Ethnic Minority. Household income was coded as less than $10,000 or more than $10,000. Employment status was coded with four categories: employed, unemployed/student/homemaker, retired, or unable to work (e.g., disabled). Marital status was coded as married/living with partner, divorced/separated/widowed, or single/never married. Next, logistic regression analyses were conducted with each sociodemographic and psychosocial factor as a prospective predictor of being at risk for low health literacy (a score of 6 or less on the REALM-R). Finally, significant univariate predictors were entered into a multivariable logistic regression model with backward, stepwise selection to identify unique significant predictors. However, because of high conceptual and statistical covariation with the REALM score, education attainment (r=.43) and CRC awareness (r=.31) were not included in multivariable or selection models. A p-value < 0.05 was considered statistically significant for all analyses.

Results

Overall, REALM-R scores ranged from 0 to 8 with a median of 7, a mean of 6.1, and a standard deviation of 2.5. Table 1 presents the frequency distribution. Sixty-four percent of participants correctly pronounced all or all but one of the words on the list (i.e., score=7 or 8). The rest of the participants were evenly distributed across the rest of the possible scores (i.e., scores of 0–6), with 6% not correctly recognizing any of the words on the list (score=0).

Table 2 presents descriptive statistics for sociodemographic variables and the results of univariable prediction of being at risk for low health literacy. Briefly, the average age of participants was 55.7 years. With regard to race and ethnicity, 243 participants self-identified as White, non-Hispanic (59%). The 171 participants in the Racial/Ethnic Minority category consisted of 115 Black, non-Hispanic (28%), 43 Hispanic (10%), and 14 (3%) who reported another race or more than one race. The majority of participants were female (54%) and had some form of health insurance (64%). Although 65% had a regular healthcare provider, only 31% had ever completed a CRC screening test in the past (none were up-to-date with CRC screening at baseline). Approximately 8% were born outside of the United States and 10% had at least one parent born outside of the United States. Characteristics significantly associated with being at risk for low health literacy in univariate models were younger age, male gender, non-White race/ethnicity, having less education, being unable to work, not having health insurance, and not having a regular physician.

Next, a multivariable analysis applying backward stepwise regression starting with significant sociodemographic variables (aside from education which was removed due to

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high conceptual and statistical covariation with the REALM score) resulted in a final model with gender, race/ethnicity, and employment status providing unique prediction of being at risk for low health literacy. Specifically, males (compared to females) and individuals self-identifying as a racial or ethnic minority (compared to non-Hispanic Whites) were more likely to be at risk for low health literacy. In addition, individuals who were unable to work (e.g., disabled) were more likely to be at risk for low health literacy compared to those who were employed or unemployed.

Table 3 presents descriptive statistics for psychosocial variables and results of univariable prediction of being at risk for low health literacy. Significant predictors were lower CRC awareness, higher PHM perceived susceptibility, higher PHM social influence, higher PHM religious beliefs, and higher cancer fatalism. Multivariable analysis applying backward stepwise regression starting with these psychosocial variables resulted in a final model with PHM perceived susceptibility, PHM social influence, and PHM religious beliefs. Specifically, being at risk for low health literacy was predicted by higher perceived CRC susceptibility scores, higher PHM social influence scores, and higher PHM religious belief scores.

The six significant predictors from the sociodemographic and the psychosocial multivariable models were included in the final multivariable analysis applying backward stepwise regression. Five of the six variables remained significant, unique predictors of being at risk for low health literacy: gender, race/ethnicity, employment status, PHM social influence, and PHM religious beliefs (see Table 4). Specifically, male gender (compared to female gender), self-identifying as being from a racial/ethnic minority group (compared to those self-identifying as non-Hispanic White), being unable to work (compared to those who were employed and to those who were unemployed), having higher social influence scores, and having higher religious belief scores were predicted being at risk for low health literacy.

Discussion

The aim of the current study was to understand the prevalence of being at risk for low health literacy (defined as a score of 6 or less on REALM-R) and the predictors of being at risk for low health literacy among a group of diverse patients aged 50–75 who were accessing primary care services at a community clinic. More than one-third of patients (36%) were at risk for low health literacy in the current sample. Univariate analyses revealed the following sociodemographic and psychosocial characteristics were associated with low health literacy: younger age, male gender, identifying as an individual from a racial/ethnic minority group, having less education, being unable to work, not having health insurance, not having a regular physician, lower awareness, higher PHM perceived susceptibility, higher PHM social influence, higher PHM religious beliefs, and higher cancer fatalism. In a final multivariable logistic regression model, significant demographic and psychosocial independent predictors of being at risk for low health literacy included male gender, identifying as an individual from a racial/ethnic minority group, being unable to work (compared to those employed), being unable to work (compared to those not employed), higher PHM social influence, and higher PHM religious beliefs.

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The current study adds to the body of literature aimed at understanding health literacy. Contrary to prior literature (U.S. Department of Health and Human Services, 2010), younger age was associated with being at risk for low health literacy in univariate analyses (however, this association was not maintained in multivariable analyses). Prior studies have found health literacy to be positively associated with CRC awareness/knowledge (Brittain et al., 2016; Morris et al., 2013). Consistent with prior studies (Dolan et al., 2004), we found that being at risk for low health literacy was associated with lower CRC awareness. However, CRC awareness and education were moderately correlated with REALM scores and, thus, were not included in multivariable analyses due to their conceptual overlap.

In multivariate analyses, three demographic factors were significantly associated with being a risk for low health literacy. First, in keeping with results of the 2003 National Assessment of Adult Literacy (Kutner, Greenberg, Jin, & Paulsen, 2006), disparities in literacy in prevalence and severity were noted among individuals identifying from a racial/ethnic group other than White in both univariate and multivariable models. Second, male gender was also associated with being at risk for low health literacy. Prior studies have shown mixed results with regard to gender differences in health literacy (Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005; White, Chen, & Atchison, 2008). Third, being unable to work was also a significant predictor of being at risk for low health literacy in both univariate and multivariable models. A study conducted in Serbia found that employment status (employed vs. other) was significantly associated with health literacy (Jovic-Vranes, Bjegovic-Mikanovic, & Marinkovic, 2009). The same study also found that the number of chronic conditions was significantly associated with health literacy (Jovic-Vranes, Bjegovic-Mikanovic, & Marinkovic, 2009). Although reasons for being unable to work may have included being disabled or having significant health concerns in the current study, we did not collect specific reasons that individuals might have been unable to work which may have further informed these findings.

In addition, two psychosocial belief variables were significant predictors of being at risk for low health literacy in multivariable models. First, higher PHM social influence scores, or greater perception that important others (i.e., healthcare providers as well as family and friends) want one to complete CRC screening and the desire to follow through with the wishes of important others, were associated with being at risk for low health literacy. This finding may be related to greater reliance on important others (as opposed to reliance on other resources) for medical decision-making. For example, a prior study found that individuals with low health literacy were more likely to seek information about cancer prevention and cancer screening from their healthcare provider and less likely to seek information on the Internet for similar information compared to those with adequate health literacy (Morris et al., 2013). Similarly, a prior study found that both lower health literacy and a higher reliance on powerful others were associated with less interest in seeking written medical information (Koo, Krass, & Aslani, 2006). Second, a unique and unexpected finding of our study was that greater reliance on religious beliefs to make health decisions was significantly associated with being at risk for low health literacy. Perhaps individuals at risk for low health literacy have developed a coping style which includes reliance on religious beliefs, and for these individuals, this is as valuable strategy for making decisions about health. Khuu and colleagues (2017) found that involvement with social and religious groups

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was associated with health literacy among Hmong American immigrants. However, reliance upon religious beliefs in medical decision-making was not measured in that study. Interestingly, a CRC intervention study conducted in another population by our study team found that one of the significant predictors of not returning a FIT kit was having higher religious belief scores (Christy et al., 2016). Overall, this unique finding of the current study highlights the importance of religious beliefs in medical decision-making among individuals with lower literacy, and this feature should be explored in further research.

Strengths and limitations

Study strengths and limitations should be noted. Strengths include the racial and ethnic diversity of the study participants, the range of levels of health literacy among participants, and large sample size. Among limitations, there is the possibility that the study findings may not generalize to individuals dissimilar to study participants as the study enrolled individuals who were non-adherent to CRC screening guidelines, were willing to participate in an RCT to promote CRC screening, and were from a limited geographic area. In addition, despite a racially and ethnically diverse sample, the number of individuals reporting Hispanic ethnicity or race other than White or Black was insufficiently small for robust analyses of these characteristics. Finally, although all participants were English speakers, we did not collect data on whether English was a participant's preferred language or language spoken at home.

Implications for patient education and communication

There are a number of patient education and communication implications. First, individuals at risk for low health literacy may be more likely to rely upon the opinions of important others and upon their religious beliefs when making healthcare decisions. Thus, health messages, materials, and media that take into account psychosocial factors such as religious beliefs or the role of important others may make these materials more personally-relevant for patients at risk for low health literacy. Second, taking into account health literacy level in patient interactions and communications may help facilitate more meaningful patient-provider encounters and also promote CRC screening. For example, a provider-based study revealed differences in CRC screening rates by intervention arm among those with lower health literacy (Ferreira et al., 2005). That study was different than the findings of two prior patient-focused studies, including one by our study team, which found no difference in screening intentions and/or uptake based upon literacy level (Davis et al., 2016; Miller et al., 2011). However, the RCT conducted by our team involved extensive instructions through visual, verbal, and written communication, provided a FIT kit, and resulted in the high CRC screening uptake in both intervention arms (Davis et al., 2016). These factors may have facilitated CRC screening behavior and self-efficacy regardless of participants' level of health literacy (Davis et al., 2016).

Although our study suggested that factors such as specific demographic factors or reliance on religious beliefs or important others may be associated with being at risk for low health literacy, it is not to suggest that these factors should be used to identify individuals with low health literacy. Instead, given the prevalence of low health literacy among the United States population (Institute of Medicine, 2004), clinicians should consider health literacy among all

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patients (e.g., universal precautions) (Agency for Healthcare Research and Quality, 2016). Indeed, it is important to provide all patients with information utilizing simplified language and clear communications as patients may be embarrassed and/or hesitant to reveal difficulties with health literacy, and indeed, may believe that their reading and comprehension abilities are adequate (Institute of Medicine, 2004). In addition, intervention materials should be produced with low health literacy communications in mind. Effective methods of creating low literacy materials include learner verification and consideration of whether materials are understandable, motivating, personally relevant, and easy to use (Doak, Doak, & Meade, 1996). Ultimately, implementing a wide range of evidence-based health literacy strategies, including adopting user-centered design principles, targeted and tailored communications, making organizational changes, and adopting a health literacy universal precautions approach could lead to improved care for all patients and their families (Agency for Healthcare Research and Quality, 2016).

Future directions

The current study suggests a number of areas for future directions. First, future analyses will consider the role of post-intervention change in self-efficacy in the relationship between health literacy and FIT kit update as prior studies have suggested that self-efficacy may mediate the relationship between health literacy and health behaviors or health outcomes (Geboers, de Winter, Luten, Jansen, & Reijneveld, 2014; Jones, Brennan, Parker, Mills, & Jamieson, 2016; Kim & Yu, 2010). Indeed, one previous study suggested that health literacy mediated the relationship between educational achievement and prior CRC screening behavior among medically-underserved individuals (Ojinnaka et al., 2015). In addition, further work is needed to better understand the relationship between health literacy and religious beliefs. This area of research could ultimately inform future intervention work as CRC screening interventions may need to incorporate or recognize the role of religious beliefs to support medical decision-making.

Conclusions

Among a population of racially-ethnically diverse patients aged 50–75 accessing primary care services in community-based clinics, more than one-third were at risk for low health literacy. Significant independent predictors of low health literacy include male gender, self-identifying as a racial/ethnic minority, being unable to work (compared to those employed or unemployed), higher social influence scores, and higher religious belief scores. It may be important for clinicians to assess and be cognizant of a variety of factors during interactions to help identify individuals who might benefit from additional assistance to address health literacy.

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At the time of this research, Enmanuel Chavarria was affiliated with Division of Population Science, H. Lee Moffitt Cancer Center & Research Institute, Tampa, Florida, USA

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Table 1.

Prevalence of REALM-R Scores (*N*=416)

REALM-R score	N (%)
0	26 (6.3)
1	12 (2.9)
2	22 (5.3)
3	17 (4.1)
4	22 (5.3)
5	17 (4.1)
6	34 (8.2)
7	79 (19.0)
8	187 (45.0)

Note. A score of 6 or less indicates being at risk for low health literacy.

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Table 2.

Sociodemographic Factors as Univariate Predictors of Low Health Literacy (*N*=416)

			Low health literacy group (0–6)		
Variable	**Level or Mean (SD)**	**N (%)**	**Odds Ratio(95% CI)**	***p*-value**	**Type 3 *p*-value**
Gender	Male	193 (46%)	2.08 (1.39–3.13)	**<.001**	
	Female	223 (54%)	-	-	
Race/ethnicity	Racial/ethnic minority	172 (41%)	3.84 (2.52–5.86)	**<.001**	
	White, non-Hispanic	243 (58%)	-	-	
Marital status	Married/Living with partner	129 (31%)	0.69 (0.41–1.18)	0.180	0.184
	Separated/divorced/widowed	186 (45%)	0.63 (0.38–1.04)	0.071	
	Never married/single	101 (24%)	-	-	
Employment status	Employed	101	0.29 (0.15–0.56)	**<.001**	**0.001**
	Not employed	212	0.52 (0.30–0.89)	**0.018**	
	Retired	31	0.43 (0.18–1.03)	0.058	
	Unable to work	72	-	-	
Annual household income	Less than $10,000	263 (63%)	1.56 (1.00–2.44)	0.052	
	More than $10,000	135 (33%)	-	-	
Birthplace	Outside of United States	31 (8%)	0.49 (0.21–1.17)	0.110	
	United States	385 (93%)	-	-	
Parent birthplace	Outside of United States	366 (88%)	1.17 (0.60–2.29)	0.650	
	United States	43 (10%)	-	-	
Health insurance	No	160 (39%)	0.62 (0.41–0.94)	**0.025**	
	Yes	256 (64%)	-	-	
Regular physician	No	146 (35%)	1.52 (1.00–2.30)	**0.049**	
	Yes	269 (65%)	-	-	
Prior CRC screening	No	286 (69%)	1.27 (0.82–1.97)	0.283	
	Yes	130 (31%)	-	-	
Age	Mean=55.7, SD=4.1	416	0.94 (0.90–0.99)	**0.019**	
Education	Mean=4.2, SD=1.1	416	0.38 (0.29–0.49)	**<.001**	

Notes. SD=standard deviation; OR=odds ratio. Totals may not equal 100% due to rounding. There were missing responses for income (n=18), regular health care provider (n=1), and race/ethnicity (n=1). For marital status and employment status, ‘single/never married’ and ‘unable to work’ was the reference group in secondary analyses to further describe the relationship between the categorical predictor variable and low health literacy. Racial/ethnic minority denotes self-identification as an individual from a racial/ethnic minority group (3 categories: Black, non-Hispanic [*n*=115]; Hispanic [*n*=43]; or other/more than one race [*n*=14]). Age and education were treated as continuous variables. Education codes were 1=Never attended school, 2=Grades 1–8, 3=Grades 9–11, 4=Grade 12 or GED, 5=College 1–3 years, 6=College graduate, and 7=Postgraduate degree. Type 3 p-value applied for variables with more than two categories.

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Table 3.

Psychosocial Factors as Univariate Predictors of Low Health Literacy (*N*=416)

		Low health literacy group (0–6)	
Factor	**Mean (SD)**	**Odds Ratio(95% CI)**	***p*-value**
CRC awareness	6.3 (2.2)	0.78 (0.71–0.86)	<.001
PHM salience and coherence	18.7 (1.8)	1.02 (0.92–1.14)	0.690
PHM perceived susceptibility	8.6 (2.9)	1.14 (1.06–1.23)	<.001
PHM response efficacy	8.8 (1.6)	0.97 (0.86–1.10)	0.671
PHM social influence	14.9 (3.8)	1.12 (1.06–1.18)	<.001
PHM religious beliefs	11.3 (5.2)	1.11 (1.07–1.15)	<.001
PHM self-efficacy	28.6 (2.6)	1.01 (0.94–1.09)	0.793
PHM cancer worry	5.2 (2.9)	0.95 (0.89–1.02)	0.143
Decisional conflict	12.7 (4.7)	0.99 (0.95–1.03)	0.560
Cancer fatalism	4.3 (3.2)	1.09 (1.02–1.16)	0.009
Trust in healthcare system	24.2 (6.7)	0.99 (0.96–1.02)	0.542
Perceived discrimination	13.5 (4.6)	1.02 (0.98–1.07)	0.307

Notes. CRC=Colorectal Cancer. PHM=Preventive Health Model

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Table 4.

Significant Multivariable Predictors of Low Health Literacy (*N*=415)

		Low health literacy group (0–6)		
Variable	**Level**	**Adjusted Odds Ratio (95% CI)**	***p*-value**	**Type 3 *p*-value**
Gender	MaleFemale	1.99 (1.26–3.13)-	**0.003**	
Race/ethnicity	Racial/ethnic minorityWhite, non-Hispanic	3.46 (2.20–5.45)-	**<.001**	
Employment status	Employed Not employed Retired Unable to work	0.28 (0.13–0.57) 0.49 (0.27–0.88) 0.44 (0.16–1.16) -	**<.010** **0.180** 0.097 -	**0.006**
PHM social influence		1.09 (1.03–1.16)	**0.005**	
PHM religious beliefs		1.07 (1.03–1.12)	**0.002**	

Notes. PHM=Preventive Health Model. Backward selection with an alpha level of.05 was used.

Type 3 p-value applied for variables with more than two categories.