ASSOCIATION BETWEEN HEALTH LITERACY AND WEIGHT MANAGEMENT BEHAVIORS AMONG INDIVIDUALS WITH HYPERTENSION: DATA FROM THE NEWEST VITAL SIGN

by

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A thesis submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Master in
Public Health

Charlotte

2016

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ABSTRACT

AISLING PLUMER SAAD. Association between health literacy and weight management behaviors among individuals with hypertension: Data from the Newest Vital Sign. (Under the direction of DR. JAN WARREN-FINDLOW)

Health literacy and healthy weight management behaviors are important public health issues, especially among individuals with hypertension. The purpose of this study was to examine the association between health literacy and healthy weight management behaviors among individuals who have hypertension (HTN). This study is a secondary analysis of data collected from a cross-sectional study conducted in an outpatient primary care clinic in Charlotte between September 2011 and March 2012. Health literacy was measured using the Newest Vital Sign (NVS). The NVS scores range from 0 to 6, and a score of 4 or more is considered adequate health literacy (AHL). Weight management behaviors were measured using a subscale of the H-SCALE, a 10-item scale that uses a five point Likert scale to assess participants' behaviors over the last 30 days (see Appendix I). Scores range from 10 to 50, and participants were considered adherent if they agreed or strongly agreed with all 10 weight management behaviors. The final sample size included for analysis was n=200. Logistic regression was performed to find the association between adequate health literacy level and adherence to healthy weight management behaviors. Of the 200 participants, 29% had AHL. After adjusting for race as a confounder, participants with AHL had 57% reduced odds of adherence to weight management behaviors (OR=0.43; 95% CI: 0.21-0.91). People with HTN who had AHL

may not be aware of health behaviors that contribute to weight management or, they may have been more focused on physical activity (PA) for weight management and were unaware of the benefits of dietary changes in addition to PA. Overall, the sample's low rates of AHL suggest the need for health literacy interventions. Future studies to investigate weight management behaviors that are measured by the H-SCALE would be useful. In addition, future research would benefit from a larger and more diverse study population.

ACKNOWLEDGMENTS

I would like to thank Dr. Warren-Findlow for encouraging me to keep moving forward with my thesis, even during the most chaotic of times. Thank you for sharing your knowledge and compassion of Public Health during my time in the MPH program. Throughout this process you continued to challenge me and take me outside of my comfort zone, for which I will be forever grateful. I would also like to thank my committee members, Drs. Sarah Laditka and Maren Coffman, for their time.

I would also like to thank my family. My husband for supporting me throughout this whole process, working hard, and being the most amazing father to our girls. My girls, for all of the love and laughs. My mother for taking care of my girls so I could work on my thesis and my father for sharing his passion for Public Health and helping me along the way with encouragement and many insights.

DEDICATION

I dedicate my Master's Thesis to my two daughters, Sydney Isabel and Elizabeth Christina.

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INTRODUCTION

Overweight and obesity are critical public health issues in the United States that require increased attention from public health practitioners. Nearly one third of the population aged 20 years and over are overweight, and 35.7% are obese (Fryar, Carrol, Ogden, & Division of Health and Nutrition Examination Surveys, 2012). Weight management is the maintenance of a normal body weight, which is considered to be a body mass index (BMI) of 18.5 to 24.9 and can be achieved through various activities, including proper nutrition and physical activity (Briggs, 2014; Chobanian et al., 2003). BMI is used to measure overweight and obesity, and is calculated using an individual's weight in kilograms divided by their height in meters squared; it provides an indicator of the results that proper nutrition and physical activity can have on an individual's weight (Flegal, Carroll, Ogden, & Curtin, 2010). An adult whose BMI is between 25.0 to 29.9 is defined as overweight and a BMI of 30.0 or more is defined as obese (Flegal et al., 2010). Weight management can refer to maintaining or achieving a normal body weight or, maintaining existing weight (i.e. not gaining weight), which can be achieved through various activities, including proper nutrition and physical activity (Briggs, 2014; Chobanian et al., 2003). Some nutritional weight maintenance suggestions include: setting a realistic weight goal; keeping a food diary; closely reading nutrition labels; practicing portion control; increasing water consumption; and decreasing alcohol consumption (Briggs, 2014). The amount of physical activity (PA) necessary to prevent weight gain varies from person to person, however, evidence shows that a minimum of two-and-a-half hours of moderate to intense PA per week is needed to maintain an individual's weight (Centers for Disease Control and Prevention, 2014). Examples of

moderate PA include brisk walking (15-minute mile), performing yard work, or taking a casual bike ride. Intense PA examples include jogging or running, swimming laps, or playing a competitive sport such as football or basketball (Centers for Disease Control and Prevention, 2014). Individuals should make PA a part of their lifestyle routine in order to effectively maintain their weight (Dubnov, Brzezinski, & Berry, 2003).

The costs associated with overweight and obesity not only affect individuals, but society as well. As overweight and obesity rates continue to increase, so does the relevant cost. Obesity accounts for 0.7% to 2.8% of the United States (U.S.) total healthcare costs (Withrow & Alter, 2011). In 2008, obesity was responsible for $147 billion annually in medical care costs in the U.S. (Hammond & Levine, 2010). In addition to the health care costs, obesity is costly to society, as many individuals with obesity are unable to work, which can be attributed to many factors, including disability and discrimination (Rashad, 2003).

Weight management is important for individuals with hypertension, as there is a positive association with normal body weight and reduced blood pressure (Brill, 2011). High blood pressure is one of the leading causes of morbidity and mortality in the United States among both men and women (Centers for Disease Control and Prevention, 2012). An individual with hypertension is defined as having an average systolic blood pressure of 140 mmHg or more and an average diastolic blood pressure of 90 mmHg or more (Centers for Disease Control and Prevention, 2012). Weight loss has been found to be an effective intervention for overweight and obese individuals in reducing their blood pressure (Brill, 2011).

Hypertension affects racial and ethnic groups unevenly (Kramer et al., 2004). Non-Hispanic Black adults have the highest prevalence of hypertension (42.1%), compared to non-Hispanic Whites (28.0%), Hispanics (26.0%), and non-Hispanic Asians (24.7%) (Nwankwo, Yoon, Burt, & Gu, 2013). Hypertension disparities can be attributed to many influences, such as limited health care access, environmental factors, poor health behaviors, social and cultural factors and socioeconomic status (Kramer et al., 2004).

In order to reduce blood pressure in individuals with hypertension (HTN), the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC) recommends life-style interventions in addition to medication therapy. Lifestyle behaviors such as weight loss, physical exercise, reduction of dietary salt intake using the Dietary Approaches to Stop Hypertension (DASH) diet, stress reduction, smoking cessation and reduced alcohol consumption, all contribute to reduced blood pressure (Chobanian et al., 2003; Ebrahim & Smith, 1998; Funk et al., 2008).

Healthy People (HP) 2020 has set many health promoting goals to reduce obesity and to reduce the prevalence of high blood pressure (Healthy People 2020, 2010). The HP 2020 goals include: increase the percentage of adults who are at a healthy weight from 30.8% to 33.9% and to reduce the percentage of obese adults from 33.9% to 30.5% (2010). HP 2020 has also set goals to increase the percentage of adults who can state if they have normal or high blood pressure from 90.6% to 92.6%; reduce the proportion of individuals with hypertension from 29.9% to 26.9%; and to increase the proportion of adults with prehypertension and hypertension who meet the recommended guidelines for BMI, saturated fat consumption, sodium intake, physical activity, and alcohol consumption (2010). Lastly, HP 2020 goals include increasing the percentage of

individuals with hypertension whose blood pressure is under control from 43.7% to 61.2% (2010).

Excess weight is a significant risk factor for hypertension. Obese individuals are 2.9 times more likely to have hypertension as compared to non-obese individuals (DÌaz, 2002; Flegal et al., 2010). Overweight men have 1.9 times the risk of hypertension and obese men have 2.6 times the risk compared to men with a normal BMI (Oster, Edelsberg, O'Sullivan, & Thompson, 2000). Women who are overweight have 2.3 times the risk and obese women have 3.8 times the risk of hypertension (Oster et al., 2000) compared to women who are normal weight. A study conducted primarily on non-Hispanic Whites reported that of those with hypertension 36.9% were overweight and 43.7% were obese (Persoskie, Kaufman, & Leyva, 2014). A study conducted on African Americans with hypertension, reported that one-third were overweight, one-third were obese, and 12.2% were extremely obese (>40 BMI) (Warren-Findlow, Seymour, & Brunner Huber, 2012).

In order for an individual to achieve or maintain a normal weight, he or she must understand the steps that need to be taken to achieve his or her goals. One way for health care providers and other practitioners who aid in weight management to confirm that the individual understands the weight management process is to assess an individual's health literacy. Nutrition and physical activity are important aspects of weight management and can be confusing, thus they need to be explained in a way that individuals can understand. An individual who does not understand how to maintain a healthy diet or engage in sufficient physical activity may get overwhelmed and give up on his or her weight management plan. Maintaining a healthy diet can be confusing because an

individual may be unable to comprehend the information on food labels, such as calculating correct portion sizes (Jay et al., 2009).

Health literacy is defined by the World Health Organization as a representation of an individual's cognitive and social skills which control his or her capability to achieve access and understand basic health information that will essentially improve his or her personal health (Hay, 2010). Individuals with sufficient health literacy are able to take responsibility for their own health, in addition to their family's and community's (Sorensen et al., 2012). People with limited health literacy may have increased hospitalizations and health care costs due to their lack of knowledge about health problems (Weiss et al., 2005). Low health literacy has been associated with weight status and poor weight management practices (James, Harville, Efunbumi, & Martin, 2014).

The purpose of this study was to examine the association between health literacy and weight management behaviors among individuals who have hypertension. This study will help to understand the relationship between health literacy and individuals' weight management practices within the context of controlling their blood pressure.

LITERATURE REVIEW

Assessing Health Literacy

In the United States, nearly 48% of English-speaking adult patients lack adequate health literacy (Andrus & Roth, 2002). An individual with adequate health literacy has the ability to read, understand, and act on health information (Andrus & Roth, 2002). Several instruments are available to measure an individual's health literacy including the Rapid Estimate of Adult Literacy in Medicine (REALM) (Murphy, Davis, Long, Jackson, & Decker, 1993), Test of Functional Health Literacy in Adults (TOFHLA) (Chisolm & Buchanan, 2007), and the Newest Vital Sign (NVS) (Weiss et al., 2005).

The most frequently reported instruments used in the research literature to measure health literacy are the REALM and the TOFLHA, which were created to specifically measure health literacy (Berkman et al., 2011; Wallace, 2006). The REALM is a reading recognition test that originally consisted of 125 common medical terms for body parts and illnesses. Participants are asked to read each term aloud, measuring their ability to recognize and pronounce the words (Murphy et al., 1993). The REALM has been shortened per the request of clinicians and researchers and now contains 66 terms (Murphy et al., 1993). The shortened version is administered by health care providers and research assistants and takes approximately two to three minutes (Murphy et al., 1993). The participant has five seconds to pronounce each word before moving on to the next word and they are scored on the total number of words they pronounced correctly. The REALM is scored based on grade levels, and adequate health literacy is considered at or above a 9^{th} grade reading level and is achieved by correctly pronouncing 61-66 words (Davis et al., 1993).

The REALM was found to have a high test-retest reliability of 0.99 (Davis et al., 1993). The REALM was assessed by health care workers and was found to have good face validity as it was received well by participants and the medical personnel felt the terms related well to health care, however it lacks in construct validity (Dumenci, Matsuyama, Kuhn, Perera, & Siminoff, 2013; Murphy et al., 1993). The REALM fails to cover three important content areas of health literacy: comprehension of health materials, numeracy, and information seeking and navigation (Dumenci et al., 2013). The REALM is helpful in health care settings in that it provides a fast way to recognize a participant's reading ability and can assist in providing the appropriate health education that a participant needs (Murphy et al., 1993). Other advantages of the REALM are that it is quick to administer which makes it ideal for busy clinical settings and it is simple to score (Dumenci et al., 2013). The disadvantages to the REALM are first that it only assesses whether a participant can pronounce a medical term correctly, and not that they understand it (Dumenci et al., 2013). Although it does cover the communication aspect of health literacy, it does not cover listening, which is a major part of communication, nor does it cover numeracy or the participants' ability to navigate through information (Dumenci et al., 2013).

The TOFLHA is a health literacy measure that consists of both reading comprehension and numeracy assessment (Golbeck, Paschal, Jones, & Hsiao, 2011). The TOFLHA asks questions pertaining to prescription labels, diagnostic procedures, and medical terms, and evaluates how well an individual can perform basic skills using real world health care situations (Andrus & Roth, 2002; Golbeck et al., 2011; Morrison, Schapira, Hoffmann, & Brousseau, 2014). The reading comprehension section is fill-in-

the-blank format with four word options provided for the participant to choose from and includes three passages associated with health and 50 blank spaces in which every fifth to seventh word is deleted (Chisolm & Buchanan, 2007; Golbeck et al., 2011). The numeracy section consists of analytical questions and assesses participants' quantitative literacy, for example, seeing if they understand the directions on medication bottles (Baker, Williams, Parker, Gazmararian, & Nurss, 1999; Golbeck et al., 2011). The TOFHLA is scored using a raw score for the reading comprehension section, 1-50 and a weighted score for the numeracy section, 1-50, totaling a final score out of 100 (Baker et al., 1999). Adequate health literacy is reached when a patient scores between 67 and 100 on the TOFHLA (Baker et al., 1999).

The TOFHLA has a strong validity with a correlation of $r = .84$ with the REALM in addition to an internal reliability with a Cronbach's α of .98 (Andrus & Roth, 2002; Chisolm & Buchanan, 2007). The TOFHLA is verbally administered by healthcare workers and research assistants and takes approximately 22 minutes to complete (Baker et al., 1999; Lindquist, Jain, Tam, Martin, & Baker, 2011). Major strengths of the TOFHLA include that it is available in both English and Spanish and it is offered in both regular and large font (Baker et al., 1999). Limitations of the TOFHLA are that it has a long administration time and that it appears to be more difficult for older individuals as compared to younger due to the use of the fill-in-the-blank method, which might underestimate older individuals' health literacy skills (Ownby & Waldrop-Valverde, 2013).

The S-TOFHLA is the shortened version of the TOFHLA; the reading comprehension section only includes 36 items and the numeracy portion includes only 4

questions (Morrison et al., 2014). The S-TOFHLA, like the original TOFHLA assesses participants' ability to comprehend medical documents and interpret other medical items, such as test results (Morrison et al., 2014). The S-TOFHLA was validated using the REALM and had a correlation of r = .80 and an overall internal consistency of Cronbach's α = .81 (Aguirre, Ebrahim, & Shea, 2005). The reading comprehension section has excellent reliability with a Cronbach's α = .97 and the numeracy section had a Cronbach's α = .68 (Baker et al., 1999). The S-TOFHLA only takes 12 minutes to administer (Morrison et al., 2014). The S-TOFHLA is more desirable to use in busy health care settings because it does not take as long to administer as the original TOFHLA and it is available in English and Spanish versions, and in regular or large font (Baker et al., 1999). A downside to the S-TOFHLA is that a ceiling effect might occur, meaning the S-TOFHLA overestimates the number of participants who have adequate health literacy (AHL), so it may not be accurate for people with low literacy levels (Morrison et al., 2014). A ceiling effect was found in the S-TOFHLA during a comparison of caregivers taking both the S-TOFHLA and the NVS (Morrison et al., 2014).

The Newest Vital Sign (NVS) is the most recent instrument developed to measure health literacy (Weiss et al.). The NVS uses the nutrition label from an ice cream container to answer six questions which focus on participants' mathematical abilities (Weiss et al., 2005). The NVS is a functional health literacy test that is used to measure participants' comprehension of health information and whether or not they can perform the tasks they have been given (Moore, 2012). It also assesses participants' document and quantitative literacy (Morrison et al., 2014). Each correct answer on the NVS receives

one point for a total possible score of six and scores of four correct answers and above are considered adequate health literacy (Morrison et al., 2014; Weiss et al., 2005).

The NVS was developed by health literacy experts and validated using the original TOFHLA (Weiss et al., 2005). Both the English and Spanish NVS were found to have satisfactory criterion validity in multiple studies, in which the English version had a Pearson r of .59 and the Spanish was r = .49 (Heinrich, 2012; Weiss et al., 2005). Multiple studies found that both the English (Cronbach's $\alpha = .76$) and Spanish (Cronbach's $\alpha = .69$) NVS had satisfactory reliability (Heinrich, 2012; Weiss et al., 2005). The NVS takes around three minutes and is usually orally administered by health care personnel or research assistants. For example, verbally asking the six questions while the participant uses the ice cream nutrition label to answer them; however, some researchers have used self-administered versions (Heinrich, 2012; Morrison et al., 2014; VanGeest, Welch, & Weiner, 2010; Warren-Findlow et al., 2014). Self-administration is beneficial in that it eliminates the use of an interviewer, except in cases where a participant is visually impaired; self-administration could save time and money (Warren-Findlow et al., 2014). The NVS has many strengths, primarily that it has a quick administration time and that it is available in both English and Spanish (Heinrich, 2012). It also has good sensitivity and specificity, allowing health care workers to know which patients they need to focus on and carefully choosing how they communicate (Weiss et al., 2005). The short length and time of test administration has also been found to reduce the shame that some participants feel when it comes to their literacy (Stagliano & Wallace, 2013). The limitations of the NVS are that it only uses a single food label to assess participant comprehension, causing it to measure a limited range of abilities, the

wording can be confusing to participants, as they may think the questions apply to them and are not hypothetical and many participants have difficulty with the mathematical portion and only answer the last two reading comprehension questions (Ownby & Waldrop-Valverde, 2013; Warren-Findlow et al., 2014).

Health Literacy Review

A total of 38 articles were reviewed based on the use of health literacy measurements. The key terms used for this literature search were health literacy, The Newest Vital Sign, Rapid Estimate of Adult Literacy in Medicine, Test of Functional Health Literacy in Adults, and Shortened Test of Functional Health Literacy in Adults. Inclusion criteria for this search included: studies conducted in the United States, in English, within the last 10 years, and participants were ages 18 years and older.

Among the articles reviewed for health literacy, 26 of the 38 were cross-sectional studies. The NVS was used in 31 of the reviewed studies: 21 studies used only the NVS and 10 used it in conjunction with another health literacy instrument. Ten studies used the REALM and ten used the TOFHLA or S-TOFHLA. Four of the 31 studies using the NVS administered it as a self-administered questionnaire (SAQ) (Gutierrez, Kindratt, Pagels, Foster, & Gimpel, 2014; Marrie, Salter, Tyry, Fox, & Cutter, 2014; VanGeest et al., 2010; Warren-Findlow et al., 2014). As this study examines health literacy within the context of hypertension, only seven studies included participants' hypertension status (Kennen et al., 2005; Marrie et al., 2014; Osborn, Paasche-Orlow, Bailey, & Wolf, 2011; Osborn et al., 2007; VanGeest et al., 2010; Warren-Findlow et al., 2014; Wolf et al., 2012).

Health Literacy Rates

Studies using the NVS to assess health literacy report the prevalence of adequate health literacy ranged from 16.2% (Dunn-Navarra, Stockwell, Meyer, & Larson, 2012) to 90.3% of participants (Mas, Jacobson, & Dong, 2014). Studies included rates from various clusters of populations, including college students, clinic patients, and community members. Two studies used a college population; however only one included rates of AHL (Cha et al., 2014; Mas et al., 2014). The AHL rate for college students was 90.3% (Mas et al., 2014), consistent with other studies (J. Warren-Findlow, personal communication, May 18, 2016). Rates of AHL for clinic patients ranged from 19% (Komenaka et al., 2014) to 70% (Jimenez, Barg, Guevara, Gerdes, & Fiks, 2013). Rates for community participants ranged from 16.2% (Dunn-Navarra et al., 2012) to 74.6% (Marrie et al., 2014).

REALM scores for limited health literacy (LHL) ($\leq 8^{th}$ grade) ranged from 23% of participants (Rothman et al., 2006) to 65% (Kennen et al., 2005). Adequate health literacy rates (defined as having a $\geq 9^{th}$ grade reading level or better) ranged from 33% of participants (Kennen et al., 2005) to 77% (Rothman et al., 2006). Higher literacy rates were found among females (69%), Whites (76%), have more than a high school education (77%), have a household income of more than $40,000 (59%), have private insurance (79%), and who did not have a chronic illness (62%).

Limited Health Literacy (LHL) rates for the S-TOFHLA ranged from 1.4% (Morrison et al., 2014) to 30.3% (Osborn et al., 2011). Adequate Health Literacy (AHL) rates ranged from 51% (Patel et al., 2011) to 98.6% (Morrison et al., 2014). Higher AHL raters were found among parents and legal guardians of children 12 years old and

younger. The median age was 32.4 years (range 18-69), and they were primarily female (85.4%), White (46%), and had training or education greater than high school (62%).

Out of the 38 studies reviewed, seven included participants with hypertension (Marrie et al., 2014; Osborn et al., 2011; Osborn et al., 2007; VanGeest et al., 2010; Warren-Findlow et al., 2014; Wolf et al., 2012). Rates of AHL among individuals with hypertension ranged from 20% (Osborn et al., 2007) to 73.7% (Wolf et al., 2012). The participants with the highest rates of AHL had a mean age of 63.1 (±5.5) and ages ranged from 55-74 years, primarily White (50.7%), female (68.4%) and 59.5% had hypertension (Wolf et al., 2012). The NVS was the most common health literacy measure used in these studies.

Assessing Weight Management

Weight management can refer to activities and behaviors that an individual undertakes to lose weight, gain weight or maintain a current weight (whether it is a normal or ideal weight). Weight management is often confused with an individual's weight status (underweight, healthy weight, overweight/obese); weight status determines which activities are appropriate to achieve optimal health (American Dietetic Association, 2009). There currently are no standardized, non-disease specific, measures to assess weight management activities in the literature. However, many studies measure weight management by assessing participants' exercise and eating behaviors through the use of surveys.

Weight Management Review

Eight articles were reviewed based on the use of weight management measures. The literature search was performed using the EBSCO database. The keywords used for

the literature search included: weight management, weight control, weight management activities, and weight maintenance. Studies were included that were in English, conducted in the United States, which included the activities performed to maintain weight. Weight management was primarily assessed using various surveys that asked participants questions about the activities they engaged in that contributed to their weight maintenance.

All of the articles reviewed used various surveys to assess weight management. The surveys included self-administered questionnaires, that contained items retrieved from national surveys such as the Youth Risk Behavior Survey (YRBS) and the National Health and Nutrition Examination Survey (NHANES) (July, Hawthorne, Elliot, & Robinson, 2003; Klos & Sobal, 2013; Nothwehr, Dennis, & Haotong Wu, 2007; Nothwehr & Peterson, 2005), data collected from the YRBS (Lenhart, Bauer, & Patterson, 2013; Neff, Sargent, McKeown, Jackson, & Valois, 1997; Paxton, Valois, & Drane, 2004) and data analyzed from the 2001-2002 NHANES (Weiss, Galuska, Khan, & Serdula, 2006). All of the surveys were self-administered and included weight management activities pertaining to exercise and diet and nutrition. Some of the surveys asked the specific activities that participants' performed (July et al., 2003; Klos & Sobal, 2013; Weiss et al., 2006), and other surveys asked how often participants performed activities (Lenhart et al., 2013; Neff et al., 1997; Nothwehr et al., 2007; Nothwehr & Peterson, 2005). The surveys that asked how often participants performed certain weight management activities provided responses such as: (1) almost never; (2) sometimes; (3) often; (4) almost always. Other surveys asked participants to remember how many of the

last seven days they performed a specific activity, such as physical activity or recommended fruit and vegetable consumption.

The weight management activities and behaviors included in the surveys were: exercise - exercised aerobically or exercised with weights; dietary changes - ate less food, ate less fat, portion control, increased water consumption, switched to low calorie foods, increased fruit and vegetable intake, switched to diet beverages, ate diet foods or products; monitoring - monitored body weight, bought a scale, or joined a weight-loss program (July et al., 2003; Klos & Sobal, 2013; Lenhart et al., 2013; Neff et al., 1997; Nothwehr et al., 2007; Paxton et al., 2004; Weiss et al., 2006). Surveys also included extreme weight management activities, such as: vomiting; skipping meals or fasting; used diet pills; or took laxatives (Klos & Sobal, 2013; Lenhart et al., 2013; Neff et al., 1997; Paxton et al., 2004).

The surveys used in the reviewed literature were not named scales, however, items were used from NHANES and YRBS (Klos & Sobal, 2013; Lenhart et al., 2013; Neff et al., 1997; Paxton et al., 2004; Weiss et al., 2006). Weight management was assessed with the use of one question (Neff et al., 1997) to 45 questions (Nothwehr et al., 2007). Two surveys used the same NHANES question to assess weight management; "What did you do to keep from gaining weight?" followed by 14 options and participants choose all that apply (Klos & Sobal, 2013; Weiss et al., 2006).

Rates of overweight/obese study participants ranged from 29% (Paxton et al., 2004) to 76% (Nothwehr et al., 2007). Rates of participants whose goal was to maintain their current weight ranged from 9.1% (Weiss et al., 2006) to 25% (Neff et al., 1997).

Weight Management Rates

The most common weight management activity was exercise (July et al., 2003; Klos & Sobal, 2013; Lenhart et al., 2013; Neff et al., 1997; Nothwehr et al., 2007; Nothwehr & Peterson, 2005; Paxton et al., 2004; Weiss et al., 2006). Participants who chose to maintain weight through exercise ranged from 11% (Neff et al., 1997) to 74% (July et al., 2003). The highest rates of exercise as a weight management activity were found among Black female college students. Another study that included a more diverse study population found that 58.8% of participants exercised for weight management and the highest rates were found among White females (Paxton et al., 2004).

Diet is another common weight management activity assessed in all of the studies (July et al., 2003; Klos & Sobal, 2013; Lenhart et al., 2013; Neff et al., 1997; Nothwehr et al., 2007; Nothwehr & Peterson, 2005; Paxton et al., 2004; Weiss et al., 2006). Diet was measured using various questions, such as a participant's fruit and vegetable consumption, water consumption, decrease in food intake, decrease in fat and calories, switching to diet beverages and/or foods, and following a special diet plan. Rates for fruit and vegetable consumption ranged from 15.5% (Lenhart et al., 2013) to 50% (July et al., 2003). The highest rates of fruit and vegetable consumption were found among Black female college students (July et al., 2003). Rates for changes in diet, including eating less food, fewer calories, or food low in fat ranged from 9% (Neff et al., 1997) to 62.3% (Weiss et al., 2006). Higher rates were found among Non-Hispanic White adults who had more than a high school education. Study participants also skipped meals in order to maintain weight, and ranged from 15.2% (Weiss et al., 2006) to 22% (Klos & Sobal, 2013). Higher rates of skipped meals were found among White males with a mean age of 28.74 years, and college graduates. Another change in diet included increased water

consumption and rates ranged from 28.1% (Weiss et al., 2006) to 53% (Klos & Sobal, 2013).

Other, less popular activities for weight management include following a special diet and joining a weight loss program or gym. Rates for those who followed a special diet, such as The Atkins Diet, ranged from 3% (Klos & Sobal, 2013) to 6.1% (Weiss et al., 2006). Rates for joining a gym or weight-loss program ranged from 5.9% (Weiss et al., 2006) to 11% (Weiss et al., 2006).

Many studies also included extreme weight management behaviors, such as fasting, taking diet pills, powders or liquids, vomiting, or taking laxatives (Klos & Sobal, 2013; Komenaka et al., 2014; Lenhart et al., 2013; Neff et al., 1997; Paxton et al., 2004). Rates of any form of extreme weight management behaviors ranged from 14.8% (Lenhart et al., 2013) to 60% (Neff et al., 1997). Highest rates were found among White female adolescents. Fasting rates ranged from 6.9% (Lenhart et al., 2013) to 17% (Lenhart et al., 2013). Highest rates were found among adolescent females. Rates of participants taking diet pills, powders, or liquids without a doctor's advice ranged from 2% (Neff et al., 1997) to 9.6% (Weiss et al., 2006). Higher rates were found among females. Rates for participants who vomited or took laxatives ranged from 2% (Neff et al., 1997) to 7% (Lenhart et al., 2013). Highest rates were found among adolescent females.

Weight Management within the Context of Hypertension

Weight management activities have been assessed within the context of hypertension self-care using a validated measure (Warren-Findlow & Seymour, 2011). Weight management activities were measured using a subscale of the H-SCALE (Hypertension Self-Care Activity Level Effects). The weight management subscale is a

10-item scale that used a five point Likert scale and assessed the participants' behaviors over the last 30 days (APPENDIX A) (Warren-Findlow & Seymour, 2011). Participants were asked whether they perform certain activities in order to lose or maintain weight (Warren-Findlow & Seymour, 2011). A 5-point Likert scale was used for response options, ranging from strongly disagree (1) to strongly agree (5) (Warren-Findlow & Seymour, 2011). The scores ranged from 10 to 50, and participants were considered adherent if they agreed or strongly agreed with all 10 weight management behaviors (40-50) (Hutchison, Warren-Findlow, Dulin, Tapp, & Kuhn, 2014). The internal consistency was good ($\alpha = .86$).

Adherence to weight management practices ranged from 30.1% among community-based African Americans with hypertension (Warren-Findlow & Seymour, 2011) to 35.2% among primary care patients with hypertension (Warren-Findlow & Seymour, 2011). Among primary care patients, Whites had higher rates of weight management adherence than Blacks (46.5% versus 32.1%)

Health Literacy and Weight Management

There is limited literature regarding assessment of activities performed for weight maintenance or control and health literacy (HL) (James et al., 2014). There are, however, studies that look into nutrition, weight status, weight loss, and/or body mass index (BMI) and the association with health literacy (Cha et al., 2014; Chari, Warsh, Ketterer, Hossain, & Sharif, 2014; Huizinga et al., 2009; Kennen et al., 2005; Lassetter et al., 2015; Marrie et al., 2014; Rothman et al., 2006; Shah, West, Bremmeyr, & Savoy-Moore, 2010; Song, Grutzmacher, & Kostenko, 2014; Speirs, Messina, Munger, & Grutzmacher, 2012; Zoellner et al., 2011).

The one study that assessed weight management and health literacy (James et al., 2014) had a sample size of 413 African American women. Health literacy was assessed using the REALM and weight management was measured by asking participants what methods they used to maintain weight, including fasting, cutting back on fried foods, skipping meals, cutting back on sweets, joining a weight loss program, exercising more often, use of laxatives, meal replacement drinks and/or bars, or diet pills. Women with adequate health literacy (AHL) were more likely to increase physical activity, join a weight-loss program, and have a gym membership as compared to those with limited health literacy (LHL) (James et al., 2014). Women with AHL had higher rates of using extreme weight loss activities. College educated African American women had higher AHL rates.

Studies that assessed BMI and/or weight status and HL found that participants with lower BMI were more likely to have AHL (Cha et al., 2014; James et al., 2014; Kennen et al., 2005; Lassetter et al., 2015; Marrie et al., 2014; Shah et al., 2010; Song et al., 2014). Studies that assessed diet and HL found that those with AHL had healthier diets. They were more likely to drink less sugar-sweetened beverages, fry chicken less often, eat the peels off of fresh fruit, read nutrition labels, have better dietary quality, and not overestimate portion sizes (Cha et al., 2014; Huizinga et al., 2009; Speirs et al., 2012; Zoellner et al., 2011).

Summary

Health literacy (HL) is an important issue in the United States and this may be related to poor population health outcomes. There are many validated instruments available to assess HL, which have been modified to accommodate participants in a

timely manner in busy clinical settings. Assessments using instruments including the REALM, TOFLHA, and NVS allow providers to recognize a participant's health literacy level and communicate with them appropriately. The highest rates of adequate health literacy were found among college students, females, and Whites.

Weight management is under studied, which results in limited instruments to measure how individuals are maintaining their weight and there are currently no standardized, non-disease specific, measures to assess weight management practices. Most studies measure weight management using BMI or participants' exercise and eating behaviors. Most of the studies reviewed were performed on specific populations; for example, all Black female college students, and thus rates are not generalizable to the US adult population. Only one measure was found to assess weight management practices and this was within the context of hypertension self-care.

There is limited literature assessing the relationship between health literacy and weight management. This study contributes to the literature by examining the relationship between HL and weight management activities among individuals with hypertension, using the H-SCALE. The above review of literature suggests an association between adequate health literacy and an individual's ability to perform weight management activities. This is especially important among individuals with HTN, as one of the key ways to control HTN is through weight management behavior, such as maintaining a healthy diet and exercise.

HYPOTHESIS

This study examined the relationship between health literacy and weight management among individuals with hypertension.

Hypothesis: Hypertensive participants with adequate health literacy (AHL) will have increased odds of adhering to healthy weight management behaviors compared to hypertensive participants who do not have AHL.

METHODS

Study Design and Population

This study is a secondary analysis of data collected from a cross-sectional study. The data being used were collected by survey with an associated medical record abstraction from September 2011 to March 2012 in an outpatient primary clinic in Charlotte, North Carolina. The clinic population was primarily Black (65%); most patients were Medicare (20%) or Medicaid (40%) beneficiaries.

Recruitment and Data Collection

Trained research assistants recruited participants from the waiting room of the clinic. Clinic patients were eligible if they self-reported having hypertension, were prescribed one or more anti-hypertensive medications, and were at least 21 years of age. Participants' hypertension status was verified through medical records.

Participants were excluded if they did not speak English, if they were visiting the clinic for a reason that did not require their blood pressure be taken (such as dropping off a medical form), and participants who did not have their blood pressure recorded that day. In addition to these exclusions, individuals accompanying clinic patients were not eligible to participate.

Participants completed a survey that included the Hypertension Self-Care Activity Level Effects (H-SCALE) measure (see APPENDIX A) and the Newest Vital Sign (NVS) (see APPENDIX B). At the completion of the survey, a research assistant accessed the participant's electronic medical record to obtain additional health information, such as blood pressure, weight and height.

Eighty-five clinic visits were made and 965 individuals approached; of these individuals, 105 were non-clinic patients, 19 were non-English speaking, and 193 declined to take the survey. Out of those who declined, 40 had already been asked to take the survey or had already taken the survey. Of the 662 remaining individuals, 47.9% (317 participants) had hypertension, but 37.8% (250 participants) were considered eligible. Of the eligible participants there was a 95.2% response rate and 200 surveys were included in the analytical sample.

Exposure Assessment

The exposure for this study is health literacy, which was measured using the Newest Vital Sign (NVS). The NVS is a six-item scale (see APPENDIX B). The NVS is primarily used in clinical settings and was created to focus on numeracy literacy (Weiss et al., 2005). The questions in the NVS assessment require the participant to answer questions in reference to nutritional information found on the food label of a container of ice cream. The participant receives one point for each correct answer. The NVS scores range from 0 to 6, and a score of 4 or more is considered adequate health literacy (AHL). The internal consistency for the NVS in this sample was good ($\alpha = .84$).

Outcome Assessment

Weight management was measured using a subscale of the H-SCALE, a 10-item scale that used a five point Likert scale and assessed the participants' behaviors over the last 30 days (see APPENDIX A) (Warren-Findlow & Seymour, 2011). Participants were asked whether they perform certain activities in order to lose or maintain weight (Warren-Findlow & Seymour, 2011). A 5-point Likert scale was used for response options, ranging from strongly disagree (1) to strongly agree (2) (Warren-Findlow &

Seymour, 2011). The scores ranged from 10 to 50, and participants were considered adherent if they agreed or strongly agreed with all 10 weight management behaviors (40-50) (Hutchison et al., 2014). The internal consistency was good ($\alpha = .86$).

Potential Confounders

Potential confounders for this study included age, gender, race, BMI, blood pressure, diabetes, high cholesterol, heart disease, and good self-rated health. Race was categorized as Black or White (referent). Age was categorized as 22-49 years (referent), 50-64 years, and 65+ years. BMI was categorized as normal weight (BMI <25) (referent), overweight (BMI ≥25<30), obese (BMI ≥30<40), and extremely obese (BMI ≥40). Referent categories were selected based on the literature. Blood pressure was measured as systolic and diastolic. Diabetes status was categorized as yes or no. High cholesterol status was categorized as yes or no. Heart disease status was categorized as yes or no. Lastly, self-rated health was categorized as good self-rated health (yes or no) if participants answered good (3) to excellent (5) versus all other responses. Any answers categorized as "no" were considered the referent group. Information for the potential confounders was abstracted from the study participant's electronic medical record (Hutchison et al., 2014).

This study includes five other hypertension self-care behaviors from the H-SCALE survey including adherence to medication usage, a low-salt diet, physical activity, smoking status, and alcohol consumption (Warren-Findlow & Seymour, 2011) (see APPENDIX C). The self-care behaviors are included as they are recommended in the "Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of Hypertension (JNC7). Four of the subscales were assessed

by asking participants to answer questions by recalling if they had done any of the actions in question during the past seven days.

Adherence to medication usage had three items and was determined by asking participants if they (1) take blood pressure medication, (2) take the medication at the same time everyday, and (3) if they take the recommended dosage. Medication usage scores ranged from 0-21 (Warren-Findlow, Basalik, Dulin, Tapp, & Kuhn, 2013). Participants were considered adherent if they scored 21. Internal consistency was adequate ($\alpha = .77$) (Warren-Findlow et al., 2013).

Adherence to a low-salt diet was assessed using 12 items, including items that ask about healthy diet behaviors, such as following a healthy eating plan, and consuming the recommended five or more servings of fruits and vegetables per day. Nine of the items are considered negative, for example, eating processed meats, and are reverse coded. Scores were continuous with a range of 0-84. Participants who followed low-salt diet behaviors six out of seven days per week, or a total score of 72, were considered adherent. Internal consistency was adequate ($\alpha = .67$) (Warren-Findlow et al., 2013).

Physical activity (PA) adherence was determined with two items asking how many of the past seven days a participant had done at least 30 minutes of PA, and how many of the last seven days they participated in an exercise activity that was not housework or part of his/her job. Scores for PA range from 0-14. Participants were considered adherent with a score of eight or more. Internal consistency was adequate ($\alpha = .77$) (Warren-Findlow et al., 2013).

Smoking exposure had two items, “how many of the past seven days did you smoke a cigarette or cigar, even just one puff?” and “how many of the past seven days

did you stay in a room or ride in an enclosed vehicle while someone was smoking?" Scores for smoking exposure ranged from 0-14 and a score of zero was considered adherent or a nonsmoker. Internal consistency was adequate (α = .78) (Warren-Findlow et al., 2013).

Alcohol use is assessed with three items, including inquiring how many drinks of alcohol they had per week (range 0-7), per day (0-∞), and the highest amount of drinks they had consumed in one day over the past month (0-∞). A participant was considered adherent if they had completely abstained from alcohol. Complete alcohol abstinence was chosen based on the H-SCALE scoring instructions; determined because the majority of study participants did not consume alcohol (74%) (Warren-Findlow et al., 2013). Good internal consistency was reported α = .88.

Data Analysis Plan

Data analysis was completed using SPSS.

Univariate Analysis

Univariate analysis was performed on all variables examined and includes frequency and percentage summaries (see Table 1).

Bivariate Analysis

Unadjusted logistic regression was performed to calculate odds ratios and 95% confidence intervals (Cis) to find the association between health literacy and weight management, as well as the other variables of interest (see Table 2 and Table 3).

Multivariate Analysis

Adjusted odds ratios and 95% CIs were calculated using multivariate logistic regression to find the association between health literacy and weight management while

controlling for confounders. Variables were considered confounders of the exposure-outcome association if there was a change in magnitude of 10% or greater (see Table 3).

Power and Sample Size

A total of 238 surveys were available for analysis. Participants with adequate health literacy were considered exposed and those with inadequate health literacy were considered unexposed. The study excluded participants who were not Black or White (n= 4), did not have a recorded NVS score (n= 30) and did not complete the weight management portion of the H-SCALE (n=10). The final sample size included for analysis was n=200. To determine power and sample size, alpha was set at 0.05, power at 80%, exposure prevalence at 29% (Hutchison et al., 2014) and outcome prevalence at 30% (Warren-Findlow & Seymour, 2011). The smallest detectable odds ratio for the association between adequate health literacy and weight management was approximately 2.20 (Demidenko, 2007).

Human Subjects Protection

The consent process for the data collection was approved by Carolinas HealthCare System's Institutional Review Board, in addition to the University of North Carolina at Charlotte's Office of Protection for Research Subjects. This secondary analysis of de-identified data was approved by UNC Charlotte IRB (protocol #12-06-19 which includes the student investigator).

Permission to Access Data

The data used for this analysis was provided by Dr. Jan Warren-Findlow.

RESULTS

Univariate Results

The sample in this secondary analysis included a total of 200 participants who were primarily Black (78.5%), female (67.5%), and between the ages of 50-64 years (mean age = 55.3 years; data not shown) (see Table 1).

In terms of their health, over 60% of participants were obese (including obese and extremely obese – BMI ≥ 30.0). A majority of study participants considered themselves to have good to excellent self-rated health (62%). The mean systolic blood pressure for the full sample was 132.9 mmHg (±19.3) and diastolic was 81.6 mmHg (±13.2). One-third of participants reported having diabetes; a majority had high cholesterol (59.9%) and 12.7% had heart disease.

Turning to self-care practices, participants had the greatest adherence to medication regimens (53.3%), alcohol abstinence (66%) and smoking abstinence (72.2%). Fewer participants were adherent to weight management behaviors (35.5%), a low-salt diet (13.7%), or participation in physical activity most days (39.9%).

Overall, 29% of participants in this study had adequate health literacy (AHL). Compared to those with inadequate health literacy (IHL), participants with AHL had a higher percentage of Whites (41.4% versus 13.4%), males (41.4% versus 28.9%) and non-smokers (84.5% versus 66.9%). However, those with AHL had a lower percent of alcohol abstainers and people adherent to weight management. Of the health characteristics studied, a larger percentage of participants with AHL were obese (69.3% versus 60.8%) but they also reported good self-rated health (67.2% versus 59.7%) in higher numbers.

Bivariate Results

Table 2 presents the unadjusted associations between demographic and health characteristics with weight management adherence. Among the demographic variables, only race was found to be significantly associated with weight management. Black participants had 51% reduced odds (OR=0.49; 95% CI: 0.25-0.97) of adhering to weight management behaviors compared to White participants. With regard to health characteristics, participants with good self-rated health had 2.47 times increased odds of adhering to weight management behaviors than those with poor or fair self-rated health (OR=2.47; 95% CI: 1.29-4.75). No other health conditions were associated with adherence of weight management behaviors.

Several self-care behaviors were associated with weight management adherence. Participants who followed a low-salt diet were 4.54 times more likely to adhere to weight management behaviors as compared to those who did not follow a low-salt diet (OR=4.54; 95% CI: 1.91-10.77). Participants who adhered to medication regimens were 2.34 times more adherent to weight management behaviors than those who did not adhere to medication regimens (OR=2.34; 95% CI: 1.27-4.30). Participants who adhered to physical activity recommendations were 2.79 times more likely to adhere to weight management behaviors as compared to those who did not (OR=2.79; 95% CI: 1.52-5.14). Alcohol and smoking were not associated with weight management behaviors.

Multivariate Results

In the unadjusted model, participants with adequate health literacy (AHL) were found to have 40% reduced odds of adherence to weight management behaviors as compared to those with inadequate health literacy (OR=0.60; 95% CI: 0.31-1.18; see

Table 3), however the results were not statistically significant. After adjusting for race as a confounder, participants with AHL had 57% reduced odds of adherence to weight management behaviors (OR=0.43; 95% CI: 0.21-0.91). After analysis, the findings did not support the hypothesis that hypertensive participants with adequate health literacy (AHL) would have increased odds of adhering to healthy weight management behaviors as compared to hypertensive participants who do not have AHL.

DISCUSSION

Summary of Main Findings

The purpose of this study was to examine the association between health literacy and weight management behaviors among individuals who have hypertension. The prevalence of individuals with AHL in this study was 29%, consistent with several other studies that used the NVS (Carpenter et al., 2014; Heinrich, 2012; Osborn et al., 2007; Zoellner et al., 2011), and considerably lower than many others (Escobedo & Weismuller, 2013; Gutierrez et al., 2014; Lassetter et al., 2015; Marrie et al., 2014; Morrison et al., 2014; Patel et al., 2011; Pendlimari, Holubar, Hassinger, & Cima, 2012; Piatt, Valerio, Nwankwo, Lucas, & Funnell, 2014; Ryan et al., 2008; Serper et al., 2014; Shah et al., 2010; Stagliano & Wallace, 2013; VanGeest et al., 2010; Wolf et al., 2012) . The multivariate findings were unexpected and did not support the hypothesis. Findings indicate that participants with AHL had 57% reduced odds of adherence to weight management behaviors (OR=0.43; 95% CI: 0.21-0.91) after controlling for race.

It is possible that people with hypertension who had AHL did not adhere to weight management practices for multiple reasons. Participants may not have been aware of certain weight management behaviors, such as reading food labels, portion control, eliminating sugary beverages, keeping unhealthy foods out of the home, eating out less often, substituting healthier foods and modifying recipes with healthier ingredients (Briggs, 2014; Warren-Findlow et al., 2014). It is also possible that participants focused on physical activity for weight management and were unaware of the benefits of dietary changes in addition to PA (Briggs, 2014; Chobanian et al., 2003).

Individuals may have dismissed other healthy weight management behaviors because they chose to focus on other health conditions, such as diabetes. Individuals with diabetes who had AHL may have believed that adherence to medication or some other self-care behavior would suffice in controlling hypertension instead of healthy weight management behaviors, and did not take into account or know that a healthy weight can help control diabetes.

Consistency with Prior Studies

This study is the first to examine the relationship between health literacy and weight management behaviors among individuals with hypertension. Due to the limited literature the findings from this study will be compared to studies that have assessed the association between health literacy and nutrition, weight status, weight loss, and/or body mass index (BMI).

The current findings were contrary to many previous studies, which suggested a positive association between AHL and healthy weight management practices (Cha et al., 2014; James et al., 2014; Zoellner et al., 2011) Those studies found that women with AHL were more likely to increase physical activity, join a weight-loss program, and have a gym membership as compared to those with limited health literacy (LHL) (James et al., 2014). Women with AHL were also found to have higher rates of using extreme (aka unhealthy) weight loss activities. Studies that assessed diet and HL found that those with AHL had healthier diets. They were more likely to drink less sugar-sweetened beverages, fry chicken less often, eat the peels off of fresh fruit, read nutrition labels, have better dietary quality, and not overestimate portion sizes (Cha et al., 2014; Huizinga et al., 2009; Speirs et al., 2012; Zoellner et al., 2011). It is possible that these study results were

not consistent with existing literature, as many of the referenced studies did not include comorbidities, as in the current study (Cha et al., 2014; James et al., 2014; Zoellner et al., 2011).

Results from the current study were similar to two studies that found that health literacy was not significantly related to most of the healthy eating practices examined (Speirs et al., 2012) or BMI (Shah et al., 2010).

Limitations and Strengths

Study findings should be viewed with the following limitations in mind that might affect the true association between health literacy and weight management. The original data were collected in a cross-sectional study, so causality cannot be determined as the exposure and outcome were assessed at the same time. Misclassification could also occur, as self-care activities were self-reported and participants may not have answered truthfully, possibly due to social desirability. Social desirability may have been reduced, as participants were made aware that their answers would not be shared with their providers. Recall bias may be a factor since participants were asked to recall self-care activities from the last seven days to as many as 30 days prior to the questionnaire. There may be selection bias, as individuals who choose to participate in a study are different from those who do not.

Additional limitations for this study include the small sample size that over represents women and African-Americans, as the clinic population where data were collected is 65% women and 65% African-American. These limitations may limit the generalizability of the findings to the broader population.

Notwithstanding these limitations, my study has strengths. First, this study fills gaps in the literature regarding the association between health literacy and healthy weight management behaviors among individuals with hypertension. This study used a validated measure to assess weight management and other self-care activities, the H-SCALE. The NVS offered a validated health literacy measure that was created specifically for a clinical setting. The NVS was particularly useful for the current study, as it uses a food label, which relates to dietary weight management practices. Lastly, health characteristics were obtained through electronic medical records, which provided clinically accurate information.

CONCLUSION

The results of the current study were significant but did not reveal a positive association between adequate health literacy and healthy weight management behaviors, as hypothesized. The findings suggest that additional research on this topic is necessary and that techniques used for individuals with inadequate HL should be used for patients of all HL levels (Kronzer, 2016). The significant result of this study was unexpected and stresses the importance that providers not assume less direct communication is acceptable for those with AHL.

Clinics and primary care facilities, similar to where the data were collected, provide an ideal environment to educate patients on healthy weight management behaviors. The findings from the current study indicate that providers should communicate clearly about the importance of weight management, be knowledgeable of health literacy techniques, and use positive reinforcement to encourage their patients to continue healthy weight management behaviors. All patients should be approached using HL best practices, such as clear communication, teach back method, and ensuring that all of the patient's questions are answered. Eliminating HL screening would allow more time for questions and interventions (Kronzer, 2016). The practice of HL screening can have a negative effect on provider-patient relationships due to stigma and other frustrations the patient may face (Wolf et al., 2007). It is important to note that the opposite has been found where HL screening did not negatively effect patient satisfaction (Ryan et al., 2008)

A future examination of the relationship between health literacy and healthy weight management behaviors could benefit from an intervention to improve weight

management behaviors. Due to scientific evidence, the Affordable Care Act (ACA) has included coverage for nutrition counseling and therapy and reimbursement for dietary or nutritional screening (Winterfeld & Cauchi, 2014). An intervention would allow researchers to test and retest after educating participants on healthy weight management behaviors, while controlling for health literacy. This study design would allow researchers to see if participants' weight management activities improved after being educated.

Overall, the current study's low rates of weight management suggest more studies need to investigate why individuals are either doing or not doing some of the weight management behaviors that are measured by the H-SCALE. In addition, future studies would benefit from a larger and more diverse study population.

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APPENDIX A: H-SCALE– WEIGHT MANAGEMENT

The following questions ask about your efforts to manage your weight during the last 30 days. If you were sick during the past month, please think back to the previous month that you were not sick. Circle the one answer that best describes what you do to lose weight or maintain your weight.

Weight management *In order to lose weight or maintain my weight…*	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
20. I am careful about what I eat.	1	2	3	4	5
21. I read food labels when I grocery shop.	1	2	3	4	5
22. I exercise in order to lose or maintain weight.	1	2	3	4	5
23. I have cut out drinking sugary sodas and sweet tea.	1	2	3	4	5
24. I eat smaller portions or eat fewer portions.	1	2	3	4	5
25. I have stopped buying or bringing unhealthy foods into my home.	1	2	3	4	5
26. I have cut out or limit some foods that I like but that are not good for me.	1	2	3	4	5
27. I eat at restaurants or fast food places less often.	1	2	3	4	5
28. I substitute healthier foods for things that I used to eat.	1	2	3	4	5
29. I have modified my recipes when I cook.	1	2	3	4	5

APPENDIX B: NEWEST VITAL SIGN

Figure 1B. Questions and answers score sheet for the newest vital sign — English.

	ANSWER CORRECT? YES	NO
READ TO SUBJECT: This information is on the back of a container of a pint of ice cream.		
QUESTIONS		
1. If you eat the entire container, how many calories will you eat?		
Answer ❑ 1,000 is the only correct answer	_____	_____
2. If you are allowed to eat 60 g of carbohydrates as a snack, how much ice cream could you have?		
Answer Any of the following is correct:	_____	_____
❑ 1 cup (or any amount up to 1 cup)		
❑ Half the container		
Note: If patient answers "2 servings," ask "How much ice cream would that be if you were to measure it into a bowl?"		
3. Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes 1 serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day?		
Answer 33 is the only correct answer	_____	_____
4. If you usually eat 2500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?		
Answer 10% is the only correct answer	_____	_____
Pretend that you are allergic to the following substances: Penicillin, peanuts, latex gloves, and bee stings.		
5. Is it safe for you to eat this ice cream?		
Answer ❑ No	_____	_____
6. (Ask only if the patient responds "no" to question 5): Why not?		
Answer Because it has peanut oil.	_____	_____
Total Correct	_____	

Figure 1A. The newest vital sign — English.

Nutrition Facts	
Serving Size	1/2 cup
Servings per container	4
Amount per serving	
Calories 250	Fat Cal 120
	%DV
Total Fat 13g	20%
Sat Fat 9g	40%
Cholesterol 28mg	12%
Sodium 55mg	2%
Total Carbohydrate 30g	12%
Dietary Fiber 2g	
Sugars 23g	
Protein 4g	8%

* Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Ingredients: Cream, Skim Milk, Liquid Sugar, Water, Egg Yolks, Brown Sugar, Milkfat, Peanut Oil, Sugar, Butter, Salt, Carrageenan, Vanilla Extract.

Note; This single scenario is the final English version of the newest vital sign. The type size should be 14-point (as shown above) or larger. Patients are presented with the above scenario and asked the questions shown in Figure 1b.

APPENDIX C: H-SCALE ITEMS

Medication Usage

How many of the past 7 days did you:

1. Take your blood pressure pills?
2. Take your blood pressure pills at the same time every day?
3. Take the recommended number of blood pressure pills?

Low-salt Diet

How many of the past 7 days did you…

4. Follow a healthy eating plan?
5. Eat potato chips, salted nuts, or salted popcorn?
6. Eat processed meats such as ham, bacon, bologna, or sausage?
7. Eat smoked meats or smoked fish?
8. Eat pickles, olives, or other vegetables in brine?
9. Eat ≥5 servings of fruits and vegetables?
10. Eat frozen prepared dinners or frozen pizza?
11. Eat store bought or packaged bakery goods?
12. Salt your food at the table?
13. Add salt to food when you're cooking?
14. Eat fried foods such as chicken, french fries, or fish?
15. Avoid eating fatty foods?

Physical Activity

How many of the past 7 days did you…

16. Do at least 30 minutes total of physical activity?
17. Do a specific exercise activity (such as swimming, walking, or biking) other than what you do around the house or as part of your work?

Smoking

How many of the past 7 days did you…

18. Smoke a cigarette or cigar, even just one puff?

Weight Management

In order to lose weight or maintain my weight…

19. I am careful about what I eat.
20. I read food labels when I grocery shop.
21. I exercise in order to lose or maintain weight.
22. I have cut out drinking sugary sodas and sweet tea.
23. I eat smaller portions or eat fewer portions.
24. I have stopped buying or bringing unhealthy foods into my home.
25. I have cut out or limit some foods that I like but that are not good for me.
26. I eat at restaurants or fast food places less often.
27. I substitute healthier foods for things that I used to eat.
28. I have modified my recipes when I cook.

Medication Usage

Alcohol

A *drink* of alcohol is defined as: one 12-oz can or bottle of beer, one 4-oz glass of wine, one 12-oz can or bottle of wine cooler, 1 mixed drink or cocktail, or 1 shot of hard liquor.

29. On average, how many days per week do you drink alcohol?

30. On a typical day that you drink alcohol, how many drinks do you have?

31. What is the largest number of drinks that you've had on any given day within the last month?

APPENDIX D: TABLES

Table 1: Demographic and health characteristics of participants with hypertension by health literacy level (n=200)

Characteristics	Inadequate Health Literacy n=142		Adequate Health Literacy n=58		Total n=200	
	N	(%)	N	(%)	N	(%)
Race						
Black	123	(86.6)	34	(58.6)	157	(78.5)
White	19	(13.4)	24	(41.4)	43	(21.5)
Gender						
Female	101	(71.1)	34	(58.6)	135	(67.5)
Male	41	(28.9)	24	(41.4)	65	(32.5)
Age						
22-49	37	(26.0)	19	(32.8)	56	(28)
50-64	77	(54.2)	29	(50.0)	106	(53.0)
65+	28	(19.7)	10	(17.2)	38	(19.0)
Body Mass Index (BMI)						
Normal weight (BMI<25.0)	14	(10.4)	3	(5.8)	17	(9.1)
Overweight (BMI≥25.0<30.0)	39	(28.9)	13	(25.0)	52	(27.8)
Obese (BMI≥30.0<40.0)	56	(41.5)	24	(46.2)	80	(42.8)
Extremely Obese (BMI≥40.0)	26	(19.3)	12	(23.1)	38	(20.3)
Good self-rated health						
Yes	80	(59.7)	39	(67.2)	119	(62.0)
No	54	(40.3)	19	(32.8)	73	(38.0)
Missing	8	(0.06)	0	(0.0)	8	(0.04)
Hypertension						
Systolic – mean(sd)	132.5	(± 19.7)	133.9	(±18.3)	132.9	(±19.3)
Diastolic – mean(sd)	81.4	(±13.7)	82.0	(±11.9)	81.6	(±13.2)
Diabetes						
Yes	52	(36.6)	18	(31.0)	70	(35.0)
No	90	(63.4)	40	(69.0)	130	(65.0)
Missing	0	(0.0)	0	(0.0)	0	(0.0)
High Cholesterol						
Yes	88	(62.0)	30	(54.5)	118	(59.9)

No	54	(38.0)	25	(45.5)	79	(40.1)
Missing	0	(0.0)	3	(0.05)	3	(0.02)
Heart Disease						
Yes	21	(14.8)	4	(7.3)	25	(12.7)
No	121	(85.2)	51	(92.7)	172	(87.3)
Missing	0	(0.0)	3	(0.05)	3	(0.02)
Self-Care Practices						
Low-salt diet adherence						
Yes	18	(12.9)	9	(15.5)	27	(13.7)
No	121	(87.1)	49	(84.5)	170	(86.3)
Missing	3	(0.02)	0	(0.0)	3	(0.02)
Medication adherence						
Yes	76	(54.7)	29	(50.0)	105	(53.3)
No	63	(45.3)	29	(50.0)	92	(46.7)
Missing	3	(0.02)	0	(0.0)	3	(0.02)
Physical activity adherence						
Yes	54	(40.0)	23	(39.7)	77	(39.9)
No	81	(60.0)	35	(60.3)	116	(60.1)
Missing	7	(0.05)	0	(0.0)	10	(0.05)
Alcohol abstinence						
Yes	98	(70.5)	32	(55.2)	130	(66.0)
No	41	(29.5)	26	(44.8)	67	(34.0)
Missing	3	(0.02)	0	(0.0)	3	(0.02)
Weight Management						
Yes	55	(38.7)	16	(27.6)	71	(35.5)
No	87	(61.3)	42	(72.4)	129	(64.5)
Missing	0	(0.0)	0	(0.0)	0	(0.0)
Non-smoker						
Yes	91	(66.9)	49	(84.5)	140	(72.2)
No	45	(33.1)	9	(15.5)	54	(27.8)
Missing	6	(0.04)	0	(0.0)	6	(0.03)

Table 2: Unadjusted odds ratios and 95% confidence intervals for the association between demographics and health characteristics with weight management adherence among individuals with hypertension (n=200)

	Weight management	
	Adherers	
	OR	(95% CI)
Race		
Black	.49	(0.25, 0.97)
White	1.00	*Referent*
Gender		
Female	1.01	(0.54, 1.87)
Male	1.00	*Referent*
Age (mean, SD)		
22-49	1.00	*Referent*
50-64	0.69	(0.29, 1.65)
65-88	1.08	(0.50, 2.33)
Body Mass Index (BMI)		
Normal weight (BMI<25.0)	1.00	*Referent*
Overweight (BMI≥25.0<30.0)	0.76	(0.20, 2.83)
Obese (BMI≥30.0<40.0)	1.95	(0.80, 4.74)
Extremely Obese (BMI≥40.0)	1.40	(0.61, 3.22)
Good self-rated health		
Yes	2.47	(1.29, 4.75)
No	1.00	*Referent*
Hypertension		
Systolic	0.99	(0.98, 1.01)
Diastolic	0.98	(0.96, 1.00)
Diabetes		
Yes	0.92	(0.50, 1.70)
No	1.00	*Referent*
High Cholesterol		
Yes	1.10	(0.50, 1.70)
No	1.00	*Referent*
Heart Disease		
Yes	0.53	(0.20, 1.40)
No	1.00	*Referent*
Self-Care Practices		

Low-salt diet adherence		
Yes	4.54	(1.91, 10.77)
No	1.00	*Referent*
Medication adherence		
Yes	2.34	(1.27, 4.30)
No	1.00	*Referent*
Physical activity adherence		
Yes	2.79	(1.52, 5.14)
No	1.00	*Referent*
Alcohol abstinence		
Yes	0.89	(0.48, 1.64)
No	1.00	*Referent*
Non-smoker		
Yes	1.29	(0.66, 2.51)
No	1.00	*Referent*

Table 3: Unadjusted and adjusted odd ratios and 95% confidence intervals of the association between adequate health literacy and adherence to weight management behaviors among primary care patients with hypertension (n=200)

	Weight Management			
	Weight Management Adherence			
	Unadjusted OR	(95% CI)	Adjusted OR	(95% CI)
Health Literacy				
Adequate	0.60	(0.31, 1.18)	0.43	(0.21, 0.91)
Inadequate	1.00	(Referent)	1.00	(Referent)