

HEALTH LITERACY: THE VALIDATION OF A SHORT FORM HEALTH LITERACY
SCREENING ASSESSMENT IN AN AMBULATORY CARE SETTING

By

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To my mom and family, my mentors, the veterans who serve our country,
my kitties, Teddy Bear Ballgame and Ishtar, who were always with me, and
Jamey Michael Vidal, the man who stood by me.

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Abstract of Dissertation Presented to the Graduate School
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Adverse health outcomes associated with low health literacy affect one in three Americans. Low literacy also consumes health care resources equivalent to billions of dollars annually. Many variables are associated with inadequate health literacy yet the exact relationships between patient variables and health literacy outcomes are unclear. Understanding patient variables associated with inadequate health literacy can provide insight into disparities in healthcare and identify priority populations. To prevent personal and system loss, healthcare providers need an efficient means of identifying patients' literacy skills. My research validated a brief screening tool in an ambulatory clinical setting against two previously validated health literacy measures. My study also identified patient variables associated with health literacy level. Finally my study identified the stage of readiness for the sample participants related to their awareness of health literacy and their utilization of patient health education.

My study was conducted with 378 veteran participants presenting in eight acute ambulatory care clinics. The proposed BRIEF screening tool and two previously validated assessments were significantly correlated with moderate positive correlations, suggesting the BRIEF is clinically valid. A Principal Component Analysis suggests the BRIEF screen measures one distinct

construct “health literacy” accounting for 60% of score variance. The receiving operator characteristic curve (ROC) analysis also suggests the BRIEF is a more sensitive measure of inadequate health literacy than the individual BRIEF items. Findings suggest clinicians can ask four brief questions to screen patients’ health literacy needs and provide as a valid indicator to alert ambulatory healthcare team members of their patients’ health literacy needs. Upon screening, clinicians can refer patients to an official evaluation and/or patient education intervention and tailor their clinical practice to meet the individual needs of patients. A multivariate analysis indicated demographic variables were jointly associated with 34% of the STOFHLA score variance. Univariate statistics suggest the majority of participants were knowledgeable about health literacy and health education; confident in their ability to seek support; and had received support related to health literacy and patient health education. My findings and their implications for research and practice are discussed.

CHAPTER 1 INTRODUCTION

Health literacy, a primary indicator of one's health status, is possessed by less than two-thirds of Americans (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993; Partnership for Clear Health Communication). The Institute of Medicine (2004) estimates that this equates to approximately 90 million people who lack literacy skills needed to function in the health environment. This health issue affects millions of people and costs billions of dollars in healthcare resources annually. Findings of the 2005 National Assessment of Adult literacy (NAAL) survey show that the literacy skills of American adults have not significantly changed over the last decade (Schneider, 2006). Each year, inadequate health literacy results in approximately \$73 billion in unnecessary health care costs (Center on an Aging Society at Georgetown University, 1999).

Health literacy was conceptualized in 1974 in the context of health education (Simonds, 1974). Over the years the concept has grown into a field of study. Today, health literacy is identified as a complex construct with many contributing variables such as: reading, seeking, exchanging, understanding and using health information. *Healthy People 2010* defines health literacy as, "The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (U.S. Department of Health and Human Services, 2000, p. 11-20). Additionally, the National Health Education Standards (Joint Committee on National Health Education Standards, 1995, p. 5) define health literacy as "the capacity of individuals to obtain, interpret, and understand basic health information and services and the competence to use such information and services in ways which enhance health." Thus, health literacy is not only the ability to read and comprehend health materials, but also requires the application of listening, analyzing, and decision-making skills in a diversity of health situations (Consumer Health Advisory Committee, 2000).

As individuals navigate through the healthcare process they use forms of communication, writing, analysis and reading skills in order to be able to effectively interact with healthcare providers and participate in decision making. These health literacy skills are critical in equipping individuals with the tools they need to interact with healthcare providers and health information. If individuals have difficulty with any of these skills, they are at increased risk of experiencing poor health related outcomes (Partnership for Clear Health Communication, n.d.). Because patients rely on these basic forms of communication and comprehension to progress through the healthcare system, an adequate level of health literacy is critical for experiencing an optimal healthcare process.

Safeer and Keenan (2005) summarize the current status of health literacy in the medical environment and their recommendations to rectify identified problems as follows:

Though most adults read at an eighth-grade level, and twenty percent of the population reads at or below a fifth-grade level, most healthcare materials are written at a 10th-grade level. Older patients are particularly affected because their reading and comprehension abilities are influenced by their cognition and their vision and hearing status. Inadequate health literacy can result in difficulty accessing healthcare, following instructions from a physician, and taking medication properly. Patients with inadequate health literacy are more likely to be hospitalized than patients with adequate skills. Patients understand medical information better when spoken to slowly, simple words are used, and a restricted amount of information is presented. For optimal comprehension and compliance, patient education material should be written at a sixth-grade or lower reading level, preferably including pictures and illustrations. All patients prefer reading medical information written in clear and concise language. Physicians should be alert to this problem because most patients are unwilling to admit that they have literacy problems (p. 463).

It is imperative that individuals who do not have an adequate level of health literacy be identified and assisted in order to promote a high quality healthcare experience for the patient, as well as prevent unnecessary healthcare costs. Identifying individuals in need of assistance is essential for promoting effective and timely intervention.

Though health literacy screening is a logical solution to identifying patients with health literacy needs, time constraints are a significant barrier to getting health professionals to assess

their patients' health literacy levels. Additionally, if clinicians did screen their patients, they would then be responsible for intervening when necessary, which may require additional time. Providing health professionals with a brief health literacy screening process and promoting the utilization of patient health education referrals provides clinicians with a time efficient means of screening patients and a viable option for patient education support.

While several health literacy screening assessments have been developed, many require specialized materials, time, and scoring interpretation. The greatest weakness of current health literacy assessments is their partial measurement of the larger holistic concept of functional health literacy. Baker (2006) concludes that the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults (TOFHLA) are "clearly inadequate" (p. 880). Though these two tools are the most commonly used measures of health literacy, Baker (2006) proposes neither adequately test "individual's capacities. Rather, the tests measure selected domains that are thought to be markers for an individual's overall capacity" (p. 880).

In efforts to create an effective brief screening tool, Chew and colleagues (2004) tested screening questions to identify patients with inadequate or marginal health literacy skills. With a sample of 332 preoperative patients, researchers provided participants with the Short Test of Functional Health Literacy in Adults (STOFHLA) [shortened version of the original TOFHLA] and 16 health literacy screening items. Findings indicated 4.5% of patients had inadequate health literacy skills and 7.5% had marginal health literacy skills on the STOFHLA. Of the sixteen health literacy screening items, three were found to effectively detect inadequate health literacy skills: How often do you have someone help you read hospital materials; How confident are you filling out medical forms by yourself; and How often do you have problems learning about your

medical condition because of difficulty understanding written information? (Chew, Bradley & Boyko, 2004). Wallace and colleagues (2006) evaluated the three questions identified in Chew's (2004) study to determine their accuracy in identifying patients with limited or marginal health literacy skills. Their study concluded one screening question was accurate in detecting individuals with limited and limited/marginal health literacy skills, How confident are you filling out medical forms by yourself?

Baker (2006) asserts that the inconsistencies between Chew and Wallace's work indicate a need for further research. Further, he and others suggest that additional research is needed to assess health literacy. Parker and colleagues (2006) state that, "More research is needed . . . a continued need to advance measuring individual skills. Efforts to advance population-level measurement and indicators are also greatly needed" (p. 891-892). The overriding objective of this study was to address this need by testing the validity of a brief four question health literacy screening tool in an ambulatory care setting within the Veterans Administration (VA).

Study Objectives

1. Validate the effectiveness of a health literacy BRIEF screening tool (4 screening questions) in the identification of participants with low health literacy skills.
2. Identify relationships between health literacy level and selected patient variables.
3. Identify the degree of perceived knowledge, confidence and readiness related to health literacy in an ambulatory VA patient population.
4. Identify the degree of confidence and readiness in an ambulatory VA patient population related to patient health education.

Research Questions

1. Does the BRIEF screening tool correlate with the STOFHLA & REALM to identify patients with inadequate health literacy in an ambulatory VA healthcare setting?
2. What patient variables are associated with health literacy level in an ambulatory VA healthcare setting?

3. What is the patient's level of knowledge, readiness, and confidence related to health literacy in an ambulatory VA healthcare setting?
4. What is the patient's level of confidence and readiness related to receiving patient health education in an ambulatory VA healthcare setting?

Delimitations

1. The study was conducted with VA patients as opposed to other patient populations.
2. Respondents were recruited from a single ambulatory healthcare setting in North Florida to provide a sample pool.
3. The study was delimited to the specificity of the items which comprised the assessment tools.
4. The respondents were comprised of a sample of volunteers.
5. The study was comprised of paper and pencil assessments and a questionnaire and thus data gathering was limited to the context of these instruments.

Limitations

Because of the following limitations the results of this study will only be generalized to VA patients in an ambulatory care setting:

1. This study used a relatively homogeneous convenience sample of VA patients presenting for care in an ambulatory setting.
2. Patients were recruited based on the voluntary participation of the VA ambulatory healthcare providers.
3. VA patients in an ambulatory care setting may be different from non-VA patients.
4. VA patients in an ambulatory care setting may be different from patients in a non-ambulatory healthcare setting.
5. VA patients who volunteered to complete the assessment may be different from those who did not volunteer to complete the assessment.

Assumptions

1. Observations are normally distributed and representative of the population.
2. The data sample was homogeneous.

3. Variation in data is due to chance.
4. Participant responses were valid and reliable.
5. The measures (Rapid Estimate of Adult Literacy in Medicine and the Test of Functional Health Literacy in Adults) used to screen patients' health literacy level were adequate and valid.
6. The time of data collection (May to August 2006) was adequate for the purposes of this study.

Definition of Terms

For the purposes of this study selected terms are defined as the following.

Health literacy - "the capacity of individuals to obtain, interpret, and understand basic health information and services and the competence to use such information and services in ways which enhance health" (Joint Committee on National Health Education Standards, 1995, p. 5).

Health education - learning experiences designed to facilitate voluntary actions, on the part of the learner, conducive to making quality health decisions.

Health educator - an individual who participates in the process of providing individuals and communities with information and skills which promote the common objectives of personal and public health education.

Patient educator - an individual who participates in the process of providing individuals and target groups (i.e. diabetics) with information and skills which promote the common objectives of personal health and healthcare education.

Clinician or Provider - any individual licensed to provide care to patients in the clinical healthcare setting.

Support – The process of providing patients with access, information, or skills related to using health information to make health decisions.

Summary

Health literacy is a primary indicator of one's health status. Approximately one in three Americans, have less than adequate health literacy skills (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993; Partnership for Clear Health Communication). An estimated 90 million people lack literacy skills necessary to function in the healthcare environment (The Institute of Medicine, 2004). Clinicians need a quick efficient means of screening patients' health literacy level to respond to patients' individual needs. The objective of this study was to test the validity of a brief four question health literacy screening tool and identify predicting variables of an individual's health literacy level.

CHAPTER 2 LITERATURE REVIEW

Defining Health Literacy

Defining health literacy provides a descriptive context for understanding what skills are required to function effectively throughout the healthcare process. The Council of Scientific Affairs of the American Medical Association (1999) refers to functional health literacy as "the ability to read and comprehend prescription bottles, appointment slips, and the other essential health-related materials required to successfully function as a patient" (p. 552). This definition implies not only a basis of knowledge, but also the ability to apply knowledge as an active participant in one's own healthcare.

In addition to basic reading, writing, and communication skills, functional health literacy also includes the capability to understand instructions on prescription drug bottles and medical education materials, comprehend doctor's instructions, find information, and analyze health information (Committee on Health Literacy, 2004). Other functional health literacy skills include actively participating in health encounters; understanding and giving consent; advocating rights; and the general ability to negotiate with complex healthcare systems (Committee on Health Literacy, 2004). Not only are there many skills required to proficiently participate in one's healthcare, but health literacy capabilities vary by context and setting and are not contingent on years of education or general reading capability. An individual who is literate in general, may have inadequate functional health literacy capabilities in the healthcare environment (Consumer Health Advisory Committee, 2000). Baker (2006) suggests several factors contribute to the measurement of one's health literacy level including reading fluency; prior knowledge; complexity of health information; oral complexity; culture; social norms; and barriers. Pawlak (2005) proposes the following determinants of health literacy: age; genetics (Cognition &

Ability); language; race and ethnicity (Culture); education (Reading Level & Technologic Competence); employment; socio-economic status; environment (Access to Care and Technology). Because there are many contributing variables to being functionally health literate anyone is likely to need assistance with the various capabilities required, regardless of demographics or socio-economic status (U.S. Department of Health and Human Services, 2000).

General Literacy & Health Literacy Assessment

There are several measures designed to evaluate an individual's literacy level. Andrus & Roth (2002) and Pawlak (2005) have identified the most popular assessments (Table 2-1). Specific to health literacy, several assessments have been developed for clinical assessment of patients' health literacy skills. The REALM and TOFHLA are the most commonly used measures of health literacy; however "neither test is a comprehensive assessment of an individual's capacities. Rather, the tests measure selected domains that are thought to be markers for an individual's overall capacity . . . [and are] clearly inadequate" (Baker, 2006, p. 880).

As educators and practitioners prepare to assist individuals with low health literacy, it is important to have an understanding of the general levels of literacy. Sometimes general reading assessments are based on criteria for four to five levels (on a scale from 0 to 500), which can provide an indication of level of health literacy abilities (See Table 2-2). Individuals scoring at level one have the ability to perform simple tasks and those who score at levels four and five are able to perform long complex tasks requiring higher cognitive levels of analysis (National Institute for Literacy).

Commonly, both general and health literacy assessments focus on a three point scale with the first level being sub-average; mid-level being marginal; and the higher level being a gradation of proficiency. Commonly, both general and health literacy assessments focus on a three point scale with the first level being sub-average; mid-level being marginal; and the higher

level being a gradation of proficiency. Similarly, the TOFHLA, Test of Functional Health Literacy in Adults (Parker, Baker, Williams, & Nurss, 1995; Nurss, Parker, Williams, & Baker, 2001), which is commonly used as an indicator for level of health literacy skills, divides scores into three criterion levels: (1) inadequate (0 to 16), (2) marginal (17 to 22); and (3) adequate (23 to 36) as seen in Table 2-2. Individuals scoring at level one on the TOFHLA do not possess the necessary skills to function efficiently when executing health literacy related tasks. Individuals scoring at level 2 have marginal skills that allow for achieving simple tasks, but not complex tasks; whereas those scoring at level three have the skills necessary to accomplish health literacy related tasks proficiently.

However, more commonly, general literacy levels are indicated by academic grade levels or equivalencies, with the numerical value correlating with the individual's grade level. For example: if a fifth grader reads and applies skills on grade level, then the individual's score is a "5"; if below level, then a "3" or "4" depending on their skills and abilities (Committee on Health Literacy, 2004). Some health literacy scales are also correlated with grade levels. The REALM, Rapid Estimate of Adult Literacy in Medicine (Davis et al., 1993) has three levels, which correspond to the general reading grade levels with scores ranging from 0 to 66 (See Table 2-3). These levels allow for an interchangeable scaling system for evaluating general and health literacy.

Rates of Health Literacy

Though adequate health literacy is critical for functioning efficiently throughout the healthcare process, at least 46% of the adult population, approximately 90 million people, lack a sufficient foundation of basic skills to function successfully; including reading basic materials, comprehension, and providing and seeking information (National Institute for Literacy, n.d.). More conservative, yet consistent estimates suggest 40 to 48% of adult Americans struggle with

functional literacy tasks (Kirsh, Jungeblut, Jenkins & Kolstad, 1993; Andrus & Roth, 2002). Fourteen % of adults in the US have a below basic level of prose literacy; 12% of US adults have below basic document literacy; 22% of adults have below basic quantitative literacy (Kutner, Greenberg & Baer, 2006). Older adults: 23% of those more than 64 years of age have below basic prose literacy; 27% below basic document literacy; 34% below basic quantitative skills (Kutner, Greenberg & Baer, 2006). Further, Kutner and colleagues (2006) suggest more than 1/3 of English-speaking patients and more than 1/2 primarily Spanish-speaking patients have low health literacy.

If 90 million people are illiterate and unable to solve problems proficiently then logic suggests they will have the same difficulties with health related information and materials (National Institute for Literacy, n.d.). For example, recent data indicate that low health literacy impacts nearly one in every three people living in the United States, approximately 90 million people (Partnership for Clear Health Communication, n.d.), suggesting that inadequate low literacy skills in the general population perpetuate inadequate health literacy skills.

In addition, the average individual reads at the 8th-9th grade level; however, most health related materials are written at a higher reading level (Partnership for Clear Health Communication, n.d.). This suggests that individuals with average reading capabilities will suffer from inadequate levels of health literacy. Inadequate health literacy combines the difficulties of low literacy skills and further complicates matters by adding complex health content. Due to the compounded nature of this problem nearly half of the population is unprepared to effectively engage in the healthcare process and therefore put themselves at risk of inadequate care, negative outcomes, and unnecessary costs. Health literacy impacts a significant portion of the general population, warranting major efforts in prevention and remediation.

Impact of Health Literacy

Partnership for Clear Health Communication (What is health literacy? n.d.) suggests,

People with low health literacy are often less likely to comply with prescribed treatment and self-care regimens, fail to seek preventive care and are at higher (more than double) risk for hospitalization, remain in the hospital nearly two days longer than adults with higher health literacy, and often require additional care that results in annual healthcare costs that are four times higher than for those with higher literacy skills (para. 2).

The impact of health literacy affects the health process in many ways. Pawlak (2005) suggests, “Low literacy, an aging population, prevalence in chronic conditions, and a complicated healthcare system influence and magnify health disparities in the United States” (p. 174). Inadequate health literacy is associated with less health related knowledge; decreased comprehension of medical information; poorer health status; poor compliance rates; infrequent and delayed use of preventative services; increased hospitalization; increased use of emergency services; increased healthcare costs; and inadequate management of chronic illness (Andrus & Roth, 2002; Dewalt, Berkman, Sheridan, Lohr, & Pignone, 2004; Pawlak, 2005). The following sections illustrate health outcomes resulting from inadequate health literacy.

Cost of inadequate health literacy. Providing the public with health literacy skills and a sense of empowerment to use those skills is a humanitarian approach to increasing the quality of healthcare. More importantly, increasing levels of health literacy is an economical approach to decreasing healthcare costs and decreasing mis-utilization of the healthcare system. Ultimately, low health literacy skills translate into as much as \$58 billion a year in U. S. health system costs (Partnership for Clear Health Communication, n.d.). The Center on an Aging Society at Georgetown University (1999), estimates that low health literacy costs the nation at least \$73 billion annually. The incurring costs of medical errors; unnecessary hospitalization; extended hospital stays; medical non-adherence; and delayed onset of healthcare all contribute to the exorbitant cost incurred annually by Americans. These data provide convincing evidence to

support the need to intervene with individuals with low and marginal health literacy to prevent negative healthcare outcomes and unnecessary healthcare costs.

Hospitalization. The American Hospital Association reports the national average cost of inpatient care is approximately \$1000 per day, and the national average hospital-stay cost is \$6000. Hospitalization costs can dramatically increase with unnecessary extended hospital stays resulting from low health literacy skills. In fact, one's level of health literacy has been found to be significantly associated with an increased risk of hospitalization (Center on an Aging Society at Georgetown University, 1999; Berkman et al., 2004). Clinical research findings suggest patients with low health literacy were more likely to be hospitalized than those with adequate health literacy skills (Baker, Parker, Williams, Clark, & Nurss, 1997; Baker, Parker, Williams, & Clark, 1998). Medicare enrollees with low health literacy were more likely than enrollees with adequate health literacy to use the emergency room and to be admitted as inpatients (Kutner, Greenberg & Baer, 2006). In addition to incurring extra medical costs, with nursing shortages and overcrowded hospitals, unnecessary hospitalization associated with low health literacy contributes to inadequate healthcare for people who are in more critical need of hospitalization.

Health outcomes. Health literacy influences a variety of health outcomes. In general, one's level of health literacy skills is the strongest indicator of an individual's health status (Partnership for Clear Health Communication, n.d.). Increased literacy levels are associated with increased knowledge of health services and the likelihood of accessing those health services. For example, individuals with low literacy skills are more likely to have not received appropriate immunizations than individuals with adequate literacy. In addition, low literacy levels are also significantly associated with higher levels of smoking (Hawthorne, 1996). Both immunizations and smoking behaviors can have long-term effects on one's health. If 90 million people are

affected by inadequate health literacy and those individuals are more likely to have not received necessary healthcare, such as immunizations or treatment for sexually transmitted diseases. Those 90 million individuals not only endanger their own health, but also the health of the others around them.

Health literacy has also been linked to the management of chronic diseases such as diabetes. Individuals with low health literacy are less likely to stabilize their blood sugar level than those individuals with adequate health literacy skills (Schillinger et al., 2002). Some studies have found correlations between literacy and measures of disease, such as people with diabetes (Kutner, Greenberg & Baer, 2006).

Mancuso and colleagues (2006) investigated the association between health literacy and asthma outcomes and assessed how health literacy affects those outcomes using the Test of Functional Health Literacy in Adults (TOFHLA). The mean age of study participants was 42 years, and 83% were women. Findings suggested ($p \leq .05$) that among respondents, over a two-year period, a lower health literacy level was associated with decreased quality of life, physical dysfunction, and increased utilization of emergency services for asthma, (Mancuso & Rincon, 2006). Low health literacy was also associated with poor longitudinal asthma outcomes. Mancuso and colleagues (2006) suggest that efforts to improve asthma outcomes should focus on improving literacy skills that promote comprehension and effective self-management. Inadequate health literacy is a significant factor in the adverse health-related outcomes resulting from non-adherence.

Associations between health literacy levels and mental health have been investigated as well. To examine these associations the majority of researchers have relied on the instrumentation of one of two popular health literacy assessments, the Rapid Estimate of Adult

Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults (TOFHLA). Lincoln and colleagues (2006) found an association between low literacy and more depressive symptoms and with more severe depressive symptoms in people with alcohol and drug dependence. (Lincoln et al., 2006). Weiss and colleagues (2006) evaluated a literacy intervention with adult patients identified as having depressive symptoms. The participants' depression scores were similar in both the intervention and control groups at baseline. Scores improved in both groups, but the improvement was significantly larger in the literacy intervention group. These research findings suggest, "there may be benefit to assessing the literacy skills of patients who are depressed, and recommending that patients with both depression and limited literacy consider enrolling in adult education classes as an adjuvant treatment for depression" (Weiss, Francis, Senf, Heist & Hargraves, 2006, p. 823).

Mortality has also been associated with low health literacy levels. In a five-year prospective study from 1999 to 2004, Sudore and colleagues (2006a) assessed the association of limited literacy with mortality among 2,152 elders without functional difficulties or dementia. Participants' mean age was 75.6 years, 48% were male, 38% were black, and 24% had limited literacy. Compared to participants' with adequate literacy, participants with limited literacy, "had a higher risk of death (19.7% vs 10.6%) with a hazard ratio (HR) of 2.03 (95% confidence intervals [CI], 1.62 to 2.55). . . limited literacy remained independently associated with mortality (HR 1.75; 95% CI, 1.27 to 2.41)" (Sudore et al., 2006a, p. 806). Sudore and colleagues (2006a) suggest limited literacy is associated with a nearly 2-fold increase in mortality in the elderly. The relationship between literacy and health is still being explored, but evidence suggests people with low literacy are more likely to report having poor health, diabetes and heart failure, than those with adequate literacy (Kutner, Greenberg & Baer, 2006).

Medication and care adherence. Recent studies assessed the relationship between literacy and medical adherence. Li and colleagues (2000) suggest literacy level is a predictor of medical adherence. Kalichman and colleagues (1999) found lower literacy skills were significantly associated with increased potential for poor adherence among patients taking medication for HIV infection. Patients with low literacy were less likely to adhere to their medical regimen than patients with adequate health literacy skills (Kalichman, Ramachandran, & Catz, 1999).

Lindau, Basu and Leitsch (2006) investigated the influence of low literacy on cervical cancer screening knowledge, and assessed the relationship between health literacy level and racial disparities in cervical cancer. Patients with inadequate literacy were less likely to follow up within one year; however findings were not statistically significant. Having less than a high school education and having a physician-estimated low literacy level were significant predictors of duration of time to follow-up. Among women with an abnormal Pap smear, those perceived by their physician to have low literacy were significantly more likely to fail to present for follow-up.

Relationships between health literacy and medical adherence have been found in a wide range of patient populations. In a sample of 197 participants with glaucoma, patients with low literacy were less adherent to their medical regimen than those with adequate health literacy skills (Muir et al., 2006). They reported a positive relationship between health literacy level and the number of received refills (Muir et al., 2006). Muir and colleagues (2006) suggest interventions designed for patients with inadequate health literacy skills may improve medical adherence.

Despite the growing amount of evidence indicating a relationship between health literacy and health related outcomes, there are some researchers who provide evidence to suggest otherwise. Though low health literacy has been associated with nonadherence to antiretroviral therapy and higher HIV-RNA levels, Paasche-Orlow and colleagues (2006) findings suggest “low literacy was not associated with a lower odds of adherence or virologic suppression in this longitudinal analysis of HIV-infected patients with a history of alcohol problems” (p. 835). Further evidence provided by Fang and colleagues (2006) suggests limited health literacy is not significantly associated with self-reported adherence, but “was associated with incorrect answers to questions on warfarin's mechanism (adjusted odds ratio [OR] 4.8 [1.3 to 17.6]), side-effects (OR 6.4 [2.3 to 18.0]), medication interactions (OR 2.5 [1.1 to 5.5]), and frequency of monitoring (OR 2.7 [1.1 to 6.7])” (p. 841).

A study of low income patients reported 42% of the patients did not understand their medication instructions, 49% could not decipher financial aid forms, and 26% did not know when their next appointment was scheduled to occur (Williams et al, 1995). The same study also concluded that low literacy patients were five times more likely to misinterpret their medication prescriptions. A study of emergency care patients showed 81% of patients could not read and understand the rights and responsibilities portion of their paperwork and 74% did not know they qualified for free care (Baker, Parker, Williams, Clark, Nurss, 1997). In a sample of 251 adult patients, Davis and colleagues (2006) found one-third of participants had low literacy. Participants’ comprehension of warning labels was associated with literacy level; and patients with low literacy were 3.4 times less likely to interpret prescription medication warning labels correctly (95% confidence interval: 2.3 to 4.9). These findings suggest patients with low literacy have difficulty understanding prescription medication warning labels (Davis et al., 2006)

Proper medication management is a vital component of chronic disease control. In a sample of patients with coronary heart disease, medication management was measured and compared with participants' literacy level. Approximately half (50.7%) had inadequate literacy skills, and 28.9% had marginal skills. Medical management was significantly associated with literacy ($P < .001$), "patients with inadequate literacy skills had 10 to 18 times the odds of being unable to identify all of their medications, compared to those with adequate literacy skills ($P < .05$)" (Kripalani et al., 2006, p. 852). If an individual does not understand his/her medical instructions or rights and responsibilities as a patient, he/she cannot optimally participate in the healthcare process. Research indicates there is a connection between health literacy and the ability to adhere to medical regimens and actively participate in the healthcare process as an informed responsible patient. Though the relationships between literacy level, adherence, and outcomes is not yet clear, current findings warrant further investigation.

Medical jargon and vocabulary comprehension. Physician-patient communication is a critical component of healthcare, yet patients commonly do not understand medical instructions and other communication with their providers. The importance of functional health literacy is obvious, but the largest study of health literacy to date amplifies the need to be functionally literate for comprehending medical language (Williams et al., 1995). In a public hospital setting with predominantly indigent and minority patients, Williams and colleagues (1995) found 35% of English-speaking patients and 62% of Spanish-speaking patients had inadequate or marginal health literacy skills. Further, 42% of patients could not comprehend directions for taking medication on an empty stomach; 26% were unable to understand appointment information; and 60% did not understand a standard informed consent document. Low health literacy is a major contributor to the communication problems between patients and their providers; patients often

remember, “less than half of what the physician tried to explain” (Kripalani & Weiss, 2006, p. 888). Further, individuals with low health literacy “may have less familiarity with medical concepts and vocabulary, and they ask fewer questions” (Kripalani & Weiss, 2006, p. 888).

Another study suggests patients are correct a mere 36% of the time when interpreting medical language (Hadlow & Pitts, 1991). In a list of 50 medical terms, no one term was correctly identified by all patient participants. The relationship between the use of technical language and outcome is that the more technical language that is used, the less comprehension and recall; providers are advised to use little technical language and check for patient understanding when they are used (Thompson, 1998). In addition, with increased specialization of providers, the more technical and difficult the terminology used with patients (Ruben, 1993). As more providers become specialists, and as technology for diagnoses and treatments becomes more complex, the knowledge gap between patients and providers widens. Thus, patients remain unassertive, uninvolved and often providers’ decisions are based on stereotypical impressions or provider assumptions, influenced by the patients lack of communication (DiMatteo & Lepper, 1998). Patients need to be competent in communicating about technical terminology as well as specific details pertaining to their illness. If they do not have this knowledge, they need to at least be able to communicate that they do not understand.

Additionally, the informed consent process is an area of research which must be addressed when determining the influence of health literacy on the healthcare process. The consideration of health literacy is vital in the research protocol process. Patients need adequate health literacy skills to knowledgeably consent to participating in a research protocol. Future research efforts in health literacy should continue to evaluate the actions needed to provide a comprehensive informed consent process that meets the requirements of risk to patients, as well as meeting the

needs of providing participants with a comprehensive informed consent process (Sugarman, & Paasche-Orlow, 2006). Providing individuals with the appropriate health literacy skills to function as proactive knowledgeable patients who can knowledgeably consent to participate in research is vital for sustaining ethical research standards.

Risk Factors Associated with Low Health Literacy

Because there are many contributing variables to being functionally health literate, anyone is likely to need assistance with the various capabilities required, regardless of demographical status (U.S. Department of Health and Human Services, 2000). However, certain populations such as the elderly, minorities, immigrants, and individuals with low socio economic status are disproportionately affected by the negative outcomes of low and marginal health literacy skills (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993). For example, Sudore and colleagues (2006b) analyzed the relationship between health literacy, demographics, and access to healthcare. Their findings suggest, “After adjusting for socio-demographics, associations remained between limited health literacy and being male, being black, and having low income and education, diabetes mellitus, depressive symptoms, and fair/poor self-rated health ($P<.02$)” (p. 770).

Further, after adjusting for socio-demographics, health status, and co-morbidities, older people with a sixth-grade reading level or lower were twice as likely to have any of the three indicators of poor healthcare access (odds ratio=1.96, 95% confidence interval=1.34–2.88) (Sudore et al., 2006b). Limited health literacy was prevalent and was associated with low socioeconomic status, co-morbidities, and poor access to healthcare, suggesting, “It may be an independent risk factor for health disparities in older people” (Sudore et al., 2006b, p. 770). The majority of adults sixty years-old and over have inadequate or marginal literacy skills; half of welfare recipients read below fifth grade level; and 40 – 50% of minorities have reading problems (Kirsch et al., 1993). Low levels of health literacy can affect the healthcare process in

many ways and cumulating risk factors can have a negative additive effect. These demographic factors are reviewed in the following sections.

Ethnicity. Minorities are historically known to experience disparities in healthcare. Disparities in healthcare among minorities are a major current research initiative (Cooper & Roter, 2003; U.S. Department of Health and Human Services, 2000; Cooper-Patrick et al., 1999). It seems clear that ethnicity and cultural background can influence patient-provider communication and patients' level of functional health literacy in at least three ways; (1) they may have different languages or dialects, (2) preferred styles of communication may differ; and (3) people from different cultures have different explanatory models for health and illness.

The dominance demonstrated by most providers, as discussed previously creates interpersonal distance between the patient and provider because the provider often assumes the role of dominance due to socio-educational backgrounds. Commonly, minority patients remain “silent” and thus the communication is broken down; especially when patient and providers come from different cultures. When people from different cultures interact in health settings, there is often a lack of acceptance and failure to respect one another. Interactions with mixed cultures within the health setting often result in negative and distorted perceptions (Cline & McKenzie, 1998). Ultimately, cultural differences and language barriers preventing quality communication need to be minimized or minority patients will continue to receive less than optimal care, with ineffective and often inappropriate communication, which will perpetuate poor health outcomes.

Previous research demonstrates the role of literacy skills and minority status in comprehension of the consent process. Sudore and colleagues report that in a sample of 204 participants (mean age of 61 years), 40% had limited literacy, and that “lower literacy (P=.04)

and being black ($P=.03$) were associated with requiring more passes through the consent process. Not speaking English as a primary language was associated with requiring more passes through the consent process in bivariate analyses ($P<.01$)” (Sudore et al., 2006c, p. 867).

Previous research also suggests ethnicity and cultural differences strongly influence communication and literacy (Cooper, & Roter, 2003). Language barriers, misunderstanding in cultural values, differences in cultural values regarding openness and disclosure in healthcare, and screening of patients based on racial and cultural characteristics are variables that can influence the patient-provider communication process (Cline & McKenzie, 1998). In a recent study conducted with a nationally representative sample of 23,889 non-institutionalized U.S. adults, Sentell & Halpin (2006) found “African Americans were 1.54 (95% confidence interval, 1.29 to 1.84) times more likely to have a work-impairing [health] condition than whites” (p. 864). When literacy level was considered, the effects of both African-American race and education were no longer significant. Sentell & Halpin (2006) suggest, “Literacy inequity may be an important factor in health disparities, and a powerful avenue for alleviation efforts, which has been mistakenly attributed to other factors” (p. 862). Recent published findings involving 3,260 participants indicate, “Black individuals had worse self-reported health status and lower influenza and pneumococcal vaccination rates” (Howard, Sentell, Gazmararian, 2006, p. 857). Though currently unclear, it appears ethnicity and health literacy level are factors in health related outcomes. These findings warrant further empirical investigation to determine the role of ethnicity and health literacy level in health related outcomes.

Education. Though research has had mixed results on the effects of patient demographics, one factor that is obviously linked to health communication and literacy skills and other cognitive abilities that are utilized when interacting with a provider and engaging in a health

treatment is level of education. Current research results suggest that level of education is directly related to a patient's ability to understand health information (Lukoschek, Fazzari, & Marantz, 2003). In a sample of 3,260, "individuals without a high school education had worse physical and mental health and worse self-reported health status than those with a high school degree; accounting for health literacy reduced these differences by 22% to 41%" (Howard, Sentell, Gazmararian, 2006, p. 857). Patients with lower educational levels have decreased understanding of health information compared to those with higher levels of education. Providers need to be aware of patients' educational level to determine any difficulties that may be inherent in comprehending medical information.

Gender. Gender influences patient health communication with providers and health literacy behaviors, in that it aggravates an already asymmetrical process (Cline & McKenzie, 1998). Females are subordinate when interacting with male providers. In general, providers spend more time with female patients; female patients talk more, ask more questions, and get more information than men (Cline & McKenzie, 1998). However, disagreements and interruptions by the provider suggest there are issues in the quality of communication between females and their providers. Further, interactions with females and their providers result in more communication, but often their concerns are not taken as seriously as those of male patients (Thompson, 1998). Some reports claim there are gender differences in the way complaints are elaborated (Thompson, 1998). Communication patterns between male patients and their providers tend to be more similar; and males receive more legitimacy and acceptance than females (Cline & McKenzie, 1998). During interactions with their providers women must remain competent, while not challenging their provider with assertive behaviors. Due to the inconclusive

evidence, more information is needed to distinguish gender differences in reading, seeking, exchanging, understanding, and using healthcare information.

Age. With the complexities of chronic health issues (many non-curable), vast experiences and wisdom, and complicated treatments i.e. multiple medications, provider-patient interactions with the elderly and their patient behaviors are significantly different from interactions with younger patients. While the average skills of U.S. adults are inadequate for navigating the healthcare system, the elderly are the most adversely affected subpopulation, which places them at increased risk of negative outcomes when compared to other age groups (Schneider, 2006). Elderly patients often want to be cared for and are less likely to challenge their provider (Cline & McKenzie, 1998). Providers tend to take more control and use loud patronizing communication and provide elderly patients with less information than they do for younger, more assertive patients (Cline & McKenzie, 1998). The current literature indicates providers tend to be less respectful, less supportive, more impatient, less engaged, and less attentive to older patients (Cline & McKenzie, 1998). These factors indicate a need to better understand how to develop interventions to address the variables that influence the quality of patient-provider interactions and the functionality of patient health literacy skills.

Health Literacy and the Medical Encounter

Identifying the socio-demographical variables that influence the healthcare process is important, but it is also imperative to understand what actually happens during a healthcare encounter. To understand patient health literacy needs in the healthcare environment requires knowledge about patient perceptions when engaging in healthcare experiences. This section will review the current research regarding what is known about the patient experience and identify gaps in the research needing further investigation.

Time restraints during healthcare visits are a primary concern when addressing the quality of health communication between patients and their providers. On average, a general practitioner conducts 120,000 to 160,000 patient interviews in a 40-year career (Center for the Advancement of Health, 2003, para. 2). The average length of a patient-physician interaction is 20.4 minutes, up from 16.3 minutes in 1989 (Mechanic, McAlpine, & Rosenthal, 2001). Researchers note that although this amount of time is adequate, patients are often unable to disclose all their concerns, ask important questions, and engage in meaningful dialogue because they are constantly interrupted in an already limited time period (Thompson, 1998). Even if medical encounters allow enough time for discussion, individuals who are not equipped with functional health literacy skills may not be likely to assert themselves in discussions with their doctor.

Physicians also control interactions with patients by asking closed-ended questions which serve to limit the amount of information they elicit and share; conveys a sense of urgency, even in non-emergency environments; and asserts superiority. Physician's vocal intensity, lack of fluency, perceived negative feedback, and abruptness may diminish the quality of patient-physician communication (Thompson, 1998). In addition, sitting disrobed on an exam table in a cold room during the encounter can be very intimidating for the patient (DiMatteo & Lepper, 1998). Individuals who lack health literacy skills are more likely to assume a submissive role in the medical encounter and fail to properly represent themselves. They are also less likely to obtain answers to questions they may have related to information they receive during their medical encounters. Ninety % of physicians feel patients have trouble following directions and identify many patients as having low levels of health literacy (Thompson, 1998). Identifying individuals' health literacy needs prior to an appointment and intervening before there is a

problem can promote clear communication and the likelihood of increasing the quality of medical encounters.

Identifying Patients with Inadequate Health Literacy Skills

As practitioners and educators become more aware of the high levels of low health literacy skills, there is increased pressure to identify individuals with low health literacy and provide those individuals with assistance to ensure optimal health behaviors and health related outcomes. First, practitioners and educators must realize that individuals with inadequate health literacy often do not realize or acknowledge their lack of health literacy (Parker, Davis, & Williams, 1999). Due to the stigma associated with the inability to read, people with inadequate literacy skills often feel ashamed when they have trouble reading. Thus, individuals will often hide their inability to read and comprehend information (Parikh, Parker, Nurss, Baker, & Williams, 1996; Baker et al., 1996). Often individuals with low literacy do not bring anyone to help them and they do not ask for assistance (Parikh et al., 1996). This can make identifying individuals with inadequate literacy difficult.

Health literacy skills can be evaluated using standardized assessments, but practitioners and educators do not always have access or time for such measurements. However, there are other informal means of identifying individuals with inadequate health literacy. One way to evaluate an individual's ability to read is to ask him/her to read materials during the course of the interaction, such as a label on a bottle. Often individuals who cannot read will say: they forgot their glasses; they will read the information when they get home; or they will discuss it later with family or friends (Parker, 2000). A practitioner should suggest reading it together to make sure there are no misunderstandings or unanswered questions. A practitioner can also ask patients about their education level. Individuals with an eighth grade education, or less, are likely to have inadequate health literacy (Parker, 2000). Individuals with a ninth grade education or higher, are

harder to identify for health literacy problems and usually require formal assessment (Parker, 2000).

Practitioners and educators should also be aware of individuals who incorrectly fill out forms or answer all items in an identical fashion. Practitioners and educators should always be aware that anyone can have inadequate health literacy skills. Other indicators of poor readers are: concrete thinking; literal interpretation of words and visuals; missing principal features; getting lost in details; and inability to interpret perceptual information (Doak, Doak, & Root, 1996). Individuals with low health literacy often avoid seeking printed materials and often look around and have poor eye contact when receiving information (Doak et al., 1996). Healthcare clinicians can benefit from taking the time to observe patients and assess indicators of low health literacy, so remediation can be implemented from the initiation of care, rather than after a misunderstanding has occurred.

The BRIEF screening tool proposed in this study takes one to two minutes to administer. Therefore, it will take approximately 15 to 30 minutes of a clinician's work day (provided they see 15 – 20 patients a day) to screen patients. Reasonably, many healthcare facilities cannot afford to lose such valuable clinic time due to other patient needs. This dilemma creates an opportunity to promote the alliance of health educators and healthcare providers in responding to patient needs in the clinical care setting. Noland and Li (2006) suggest promoting the use of health educators in the clinical setting as a reimbursable service is critical to advancing the field of health education; gaining public trust; increasing professional visibility and accountability. Further, health educators have the expertise to identify and appropriately respond to patients with inadequate health literacy skills. Further as a reimbursable service, health educators can pay for themselves while increasing the recognition of health education as a legitimate profession.

Currently, too often nurse educators attempt to fill the role as a clinical care provider and an educator (particularly in nutrition and diabetes). This duality is certainly a contributor to the excessive demands that lead to burn out in the nursing profession. Thus, if patient health educators were employed as members of the healthcare team, they could provide reimbursable patient health education services. Ideally, this role as members of the healthcare team would advance the field of health education; contribute to increased quality of care; promote personal health; and provide as a support resource for nursing professionals in the clinical setting.

Further, it takes additional time to respond to individuals with inadequate health literacy. Detailed explanations about healthcare may need to be provided in a slower cadence, using non-medical terms. Some patients may need to read and review written materials with their healthcare provider or advocate. Though these adjustments would take additional time from the clinician's work day, these investments of preventative effort can result in better health outcomes such as, but not limited to, fewer missed appointments; shorter periods of hospitalization; increased adherence; and decreased use of emergency services (Andrus & Roth, 2002; Dewalt, Berkman, Sheridan, Lohr, & Pignone, 2004; Pawlak, 2005). Reducing the adverse outcomes of undetected inadequate health literacy can ultimately save time for clinicians and prevent the unnecessary costs associated with inadequate health literacy. Thus the investment for employing patient educators pays for itself and prevents poor patient outcomes.

In response to concerns related to required time for patient screening, providers should recognize that individual screening for health literacy is only necessary once every five to ten years, or after traumatic events. Further, if patients' health literacy level is posted in their permanent patient record, all members of the healthcare team can be privileged to the information and, based on the recorded health literacy assessment, can respond accordingly. The

benefits of screening and identifying patients' health literacy level clearly outweigh the costs in time and effort. No longer should clinicians make assumptions about their patients' ability to read, comprehend, apply, and provide health information.

Patient Participation

Patients benefit from taking an active role in their medical care choices. Patients who are active in their experience have greater satisfaction, greater alleviation of their symptoms, better control of their chronic conditions, less distress about their illness, and have better response to surgery and invasive diagnostic treatments (DiMatteo & Lepper, 1998). Patients who are involved in their healthcare feel a greater sense of control over their health and their lives in general, have more positive expectations for their health, and demonstrate better adherence to the treatment, in which they helped in the decision making (DiMatteo & Lepper). Active patients are less likely to blame providers for less than optimal outcomes, while less active patients give less adequate histories, and tend to delay reporting symptoms. Lastly they are more likely to litigate malpractice when they have less positive outcomes (DiMatteo & Lepper). Gaining knowledge about what patients are currently doing when interacting with their providers and what behaviors they are engaging in is key to gathering information and identifying the needs of patients to increase their ability to read, seek, exchange, understand, and use health information.

Barriers to Patient Participation

There are several barriers that prevent patients from being active participants in their healthcare. Foremost, patients find it difficult to increase their involvement; additionally provider feedback can act as a barrier. For example, if the provider responds negatively, the patient is less likely to be satisfied, than if the provider is positive. Cultural barriers also moderate the likelihood of patient involvement (Thompson, 1998). Other barriers that affect a patient's active participation in his/her healthcare include being disrobed during an interaction led by a provider

who typically limits patient responses. Patients trying to behave and act as a “good patient” are silent, in order to not take up the valuable time of a rushed provider. Another major barrier for patients is their entry into the healthcare encounter while ill and with considerable anxiety, thereby compounding an already complex interaction (DiMatteo & Lepper, 1998). Patients who perceive communication barriers with their providers experience more pain and more difficulty discussing their experience of pain with others, such as family members. Anxiety; coping style; not wanting to distract the doctor; wanting to look like a good patient; and being concerned that increased pain means progression of the disease are several factors that interfere with patients’ ability to communicate about pain (Thompson, 1998). Ultimately, many factors influence whether a patient will participate actively in his/her healthcare. Understanding what prevents patients from optimally interacting with healthcare providers and engaging in the healthcare process is key to gathering information and identifying the needs of patients to increase their ability to read, seek, exchange, understand, and use health information. Further, advocacy, social support, and patient education resources and support can mediate the outcomes associated with one’s health literacy level.

Patient Education Programs

As researchers and health educators become more aware of the magnitude of inadequate health literacy in the United States, large organizations and institutions of academics and health join together to develop educational materials for dissemination. For example, the Florida Health Literacy Study is a collaborative effort between the University of South Florida and Pfizer Health Literacy Interventions to disseminate Pfizer health literacy educational materials to patients to increase their ability to navigate through the healthcare process effectively (Florida Health Literacy Study, 2003). Pfizer hosts another literacy program “Ask Me 3”, under the auspices of the National Partnership of Clear Health Communication. This Partnership of Clear

Health Communication has several large credible partnering agencies, such as the American Medical Association. This program is a national communication campaign and provides a web site, information and educational materials for patients and physicians (Partnership of Clear Health Communication, n.d.). Bayer Institute for Healthcare Communication (n.d.) also disseminates patient education using a coaching system and other educational resources to P.R.E.P.A.R.E. patients to be active participants in the treatment process. Private organizations, governmental agencies and other academic institutions have an array of health literacy programs throughout the country for patients and physicians that provide instructional materials and mentoring programs including an array of health literacy skills (Singleton, & Terrill, 2003).

Health Literacy Skills

Adequate health literacy includes the ability to evaluate information for credibility and quality, analyze risks and benefits, determine dosages, understand test results, and locate health information (Consumer Health Advisory Committee, 2000). To accomplish these tasks, individuals need to be able to understand graphs and other visual information, obtain and apply information, and calculate numbers. Language skills are needed to articulate their health concerns and describe their symptoms (Consumer Health Advisory Committee, 2000). Patients need to ask relevant questions, understand medical advice or medical instruction, and employ decision-making skills. With increased accessibility to computers, patients can also benefit from obtaining the ability to search the internet and evaluate web sites (Consumer Health Advisory Committee, 2000).

Reviews of patient training studies (Cegala & Broz, 2003; Cegala, Clinch, & Gade, 2003) suggest the primary communication skills needed by patients are information seeking, expressing concerns, assertiveness, information provision, and verifying information. Reflection, summarizing, and processing knowledge are critical skills used in training patients to

communicate (Cegala & Broz, 2003). Patient skills, such as communication skills, have been operationalized and empirically tested and have been shown to have a strong impact on the information exchange between patients and their physicians (Cegala et al., 2003). Ultimately, individuals need to be able to express their needs; articulate their symptoms; listen to their healthcare providers; understand provided information and instructions; assimilate information and use it to make decisions; participate in the decision making process; ask pertinent questions; calculate and determine medication dosages; find quality information; verify information; and follow their medical treatment plan. Educators and practitioners can benefit by including these skills in their intervention development process to ensure program success.

Patient Empowerment

In addition to obtaining skills, health educators and practitioners can create an infrastructure for empowering patients. Health empowerment is described as the combined function of self-efficacy and adequate health literacy skills (Hubley, 2002). Patient empowerment is a central concept in models for improving healthcare outcomes and catalyzing health reform efforts (Segal, 1998; Salmon & Hall, 2003). The premise of patient empowerment suggests patients have a right to make decisions about their healthcare and can assume a leadership role during the healthcare process. The concept of patient empowerment was founded as a solution for the long-term care needs of chronically ill patients such as individuals with diabetes and cancer (Segal, 1998). However, with healthcare reform initiatives underway it has become apparent that patient empowerment is vital to help all individuals proficiently facilitate the process and outcomes of their healthcare encounter.

If patients are equipped with functional health literacy skills and feel confident about taking action and decision-making, this can translate into a belief that they can influence the healthcare process and into higher levels of health empowerment. Patients who empower

themselves have improved health outcomes and consume fewer health care resources than patients who do not (Office of the Public Advocate and Headway, 1992). Standard practice should include providing all patients with supportive assistance, reinforcing patient participation and mutually deciding what additional assistance or resources may be necessary. Efforts can be made at the interpersonal and organizational level to promote an environment that supports patient understanding and empowers patients to be active participants throughout the healthcare process. The following section provides techniques for providing assistance and empowering patients.

Creating a Shame-free Environment and Providing Resources

Providing a shame-free empowering environment will reinforce patients' ability to effectively communicate and navigate through the healthcare system. Creating a supportive, non-stigmatizing environment for low literacy patients can promote proactive behaviors rather than perpetuate feelings of shame (Parker, 2000). These facilities can provide patients with surrogate readers or advocates to assist them when getting information from practitioners, thereby promoting a support system for successful healthcare outcomes (Potter & Martin, 2003). Patients identified as having low levels of health literacy should be provided with support, verbal explanations, written materials with only the necessary information presented in simple terms and pictures, and alternative resources such as videotapes (Parker, 2000; Potter & Martin, 2003). Implementing these practices will decrease the stigma associated with needing assistance and emphasize the importance of understanding health materials in a shame-free environment. Health education and care facilities can prepare educators and practitioners to be sensitive to low literacy individuals to promote a shame-free environment (Parikh et al., 1996). Any efforts healthcare and educational facilities take to empower patients with functional health literacy

skills and the self-efficacy to use them will promote optimal healthcare outcomes and an economical and ethical practice.

Theoretical Framework

This study utilized a multidimensional theoretical perspective for the purpose of placing this research within a framework in which the information can be considered within a pragmatic context (See Figure 2-1). The contributing theories and frameworks are discussed in the following sections.

Systems Theory

The theoretical framework for this study is founded in Systems Theory which states open systems, such as a healthcare system or a biological system, are made up of sub-systems. The forces of other sub-units within the system affect all other sub-units, ultimately creating a ripple effect throughout the entire system. The system as a whole works in a symbiotic fashion to create a higher order state of equilibrium. Within complex systems, sub-systems interact with one another to produce output (Giacomo & Weissmark, 1986). Systems Theory also assumes that information must flow to create balance between systems and the environment. Systems rely on input which is received and processed, resulting in an output which generates feedback which is again received as input – creating an ongoing cyclical reciprocal process. Reciprocal relations occur with systems that provide feedback. The recursive nature of feedback results in information transformation and can modify the output of the system thereby regenerating system proficiency. When the flow of information is disrupted, the individual experiences imbalance which can manifest in many forms. This process occurs with individuals, between individuals, in organizations and beyond (Brown, Pryzwansky, & Schulte, 2001).

Provided these assumptions are true, then the following are true: (1) the actions or inactions of a patient can affect his/her own healthcare process; (2) interaction between a patient

and his/her provider can affect the patient's healthcare process and outcomes; (3) the stated affects ultimately affect the larger healthcare system in which these sub-systems interact. Thus influencing factors associated with how patients interact with health information and healthcare providers can influence the patient's health; their interactions with providers; health related outcomes; and other systemic outcomes in general.

Ecological Model

Illustrating systemic nature of healthcare encounters, Street (2003) applied an ecological model to communication in medical encounters. The ecological approach, like systems theory, evaluates the inter-relationships, the ecological approach focuses on how the organism (the individual) interacts with his/her environment (medical encounter). Street (2003) proposes that there is a dynamic series of interrelations occurring during medical encounters which impact the quality of interaction including organizational; media; cultural; political-legal; and maybe most importantly the interpersonal context. Within the interpersonal context, the ecological model accounts for the multidimensional multivariable representation of the facets of the pre-disposing and cognitive affective influences of the patient and the provider. The model provides a simple yet dynamic understanding of the assumptions of the existing interactions happening within the context of interaction between the patient and his/her healthcare provider. For example, the model accounts for a patient's communication style; self-concept; linguistic resources; verbal and nonverbal behavior; goals; perceptions; emotional state; and communicative strategies. Within this context it seems logical to place the patient's ability to exchange, comprehend, and use health information. Such that the identification of one's level of health literacy skills is a primary factor when addressing the interpersonal context of medical encounters within the ecological and systemic theoretical framework (research question #1). Thus, making these

assumptions this study proposed to identify a means of quickly assessing patients' health literacy skills to support providers in adapting and responding to their patients' needs.

Further the ecological model accounts for the cultural context of medical encounters suggesting that patient factors such as race, ethnicity, socio-economic status, education, gender, etc. can influence the medical encounter and subsequent outcomes. This study seeks to address these potentially influencing variables as they relate to one's level health literacy skills (research question #2). These findings will contribute to identifying and understanding the influencing variables associated with patients' ability to use health information and effectively interact with their providers.

Transtheoretical Model & Stages of Change

To evaluate participants' level of knowledge about health literacy (research question # 3) and their readiness to engage in patient education (research question # 4) this study utilized the Transtheoretical Model (TTM), specifically the Stages of Change. This theoretical model of behavior change is founded on research conducted over the last fifty years (Prochaska, Norcross & Diclemente, 1994). A list of the constructs associated with the Transtheoretical Model used in this study can be found in Table 2-4.

The constructs of TTM interact over time to ideally produce behavior change such as utilizing patient education resources or increasing awareness of health literacy. The five stages of change relate to an individual's stage relative to engagement in a behavior; from contemplation (not even considering the behavior) to maintenance (maintaining the behavior) (Prochaska, Norcross & Diclemente, 1994). Self-efficacy serves as the most important predictor of behavioral success. One's self-efficacy contributes to their success or failure at each stage of change. This study also utilized the concept of consciousness raising. Based on the theoretical construct of "consciousness raising," this study makes the assumption that if people are made

aware of health literacy and provided resources identified as patient health education, they will become more aware of the constructs and utilize patient education resources. It is further suggested that as the population increases their awareness of health literacy and patient health education resources, they will increase their utilization of patient health education, thus promoting optimal health related outcomes.

Summary

Ninety million individuals, have less than adequate health literacy skills (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993; Partnership for Clear Health Communication), which result in approximately 73 billion dollars in unnecessary healthcare costs annually (Center on an Aging Society at Georgetown University, 1999). The outcomes associated with inadequate health literacy skills can affect anyone despite their age, race, education or income (Partnership for Clear Health Communication, n.d.). Regardless of socio-cultural background the effects of inadequate health literacy are detrimental to the individual and society as a whole. It is imperative that researchers establish a time-efficient, economical, easy and valid assessment to provide health professionals with a viable means of screening and intervening with patients. It is also imperative that data is gathered about patients' awareness, readiness, confidence, and utilization related to health literacy and patient health education. These data will provide direction for health literacy screening development as well as assess the population's current awareness of health literacy and awareness of, and utilization of, patient health education.

Table 2-1. General literacy and health literacy screening assessments.

Variable	WRAT-R	REALM	MART	SORT-R	PIAT-R	IDL	TOFHLA
Description	Word Recognition Test	Medical Word Recognition Test	Medical Word Recognition Test	Word Recognition Test	Reading Recognition & Comprehension Test	Reading Comprehension Test	Reading Comprehension & Numerical Ability Test
Age	5-74 years	Adults Only	High-school	4 years and older	All ages	All ages	Adults Only
Time to Administer (minutes)	3-5	2-7	3-5	5-10	60	20-30	22 (7 for short form version)
Scoring	Raw score of 1-57, converted to grade equivalent	Approximate grade level: 3 rd and below; 4 th -6 th , 7 th -8 th , or 9 th and above	Raw score converted to grade equivalent	Results converted to age and grade equivalent	Comprehension subtest score determines grade level	0-8, 0 = failure at first grade level, 8 = 8 th grade level or above	Comprehension and numeric test: inadequate, marginal, or functional health literacy
Advantages	Quick	Quick, uses medical terminology	Quick, non-threatening	Quick	Assesses Comprehension	Available in Spanish	Available in Spanish
Limitations	Difficult	Assigns only grade range equivalent	Published clinical experience limited	Small print; many items intimidating	Long	Long	Long
Correlation with other Tests (r value)	PIAT-R 0.62-0.91	WRAT 0.88, SORT-R 0.96, PIAT-R 0.97, TOFHLA 0.84	WRAT 0.98	PIAT-R 0.83-0.90	Not Available	0.65-0.70 with other English assessments	WRAT 0.74, REALM 0.84

WRAT-R = Wide Range Achievement Test-Revised; REALM = Rapid Estimate of Adult Literacy in Medicine; MART = Medical Terminology Achievement Reading Test; SORT-R = Slosson Oral Reading Test-Revised; PIAT-R = Peabody Individual Achievement Test-Revised; IDL = Instrument for the Diagnosis of Reading; TOFHLA = Test of Functional Health Literacy in Adults. Table adapted from *Tables for Health Literacy: A Review* (Andrus & Roth, 2002, p. 284-285) and published by Pawlak, 2005, in *Economic Considerations of Health Literacy, Nursing Economics*.

Table 2-2. Scale for levels of TOFHLA/STOFHLA and general literacy skills.

TOFHLA Level	TOFHLA Score	General Literacy Score	Skills and Abilities
Inadequate	0-16	0-225	Able to perform uncomplicated tasks involving brief and uncomplicated texts and documents.
Marginal	17-22	226 - 275	Able to locate information in text, make low level inferences using printed materials and integrate easily identifiable pieces of information.
		275 – 325	Able to integrate information from relatively long or dense texts or documents, determine appropriate arithmetic operations based on information contained in the directive, and identify quantities needed to perform operation.
Adequate	23-36	326 - 375 376 - 500	Adults at these levels demonstrate proficiencies associated with long and complex documents and text passages; able to determine and interpret qualitative and quantitative data needed to perform an operation.

Table 2-3. Levels for grade equivalent scale of the Rapid Estimate of Adult Literacy in Medicine (REALM).

REALM Level	REALM Score	Grade Level	Skills and Abilities
Limited	0-44	0 – 6	Not able to read most low literacy health materials; will need repeated oral instructions; materials should be composed of illustrations or video tapes. Will need low literacy materials; may not be able to read a prescription label.
Marginal	45-60	7 – 8	Will struggle with most patient education materials.
Adequate	61-66	9 - and above	Will be able to read and comprehend most patient education materials.

Table 2-4. Description of Stages of Change, Self-efficacy & Consciousness Raising.

Construct	Description
Stages of Change	
Precontemplation	Has no intention to take action in next 6 months
Contemplation	Intends to take action in next 6 months
Preparation	Intends to take action within the next thirty days and has taken some behavioral steps in this direction
Action	Has changed overt behavior for less than 6 months
Maintenance	Has changed overt behavior for more than 6 months
Self-efficacy	Confidence that one can engage in the healthy behavior across different and challenging situations
Consciousness Raising	Finding and learning new facts, ideas, and tips that support the healthy behavior change

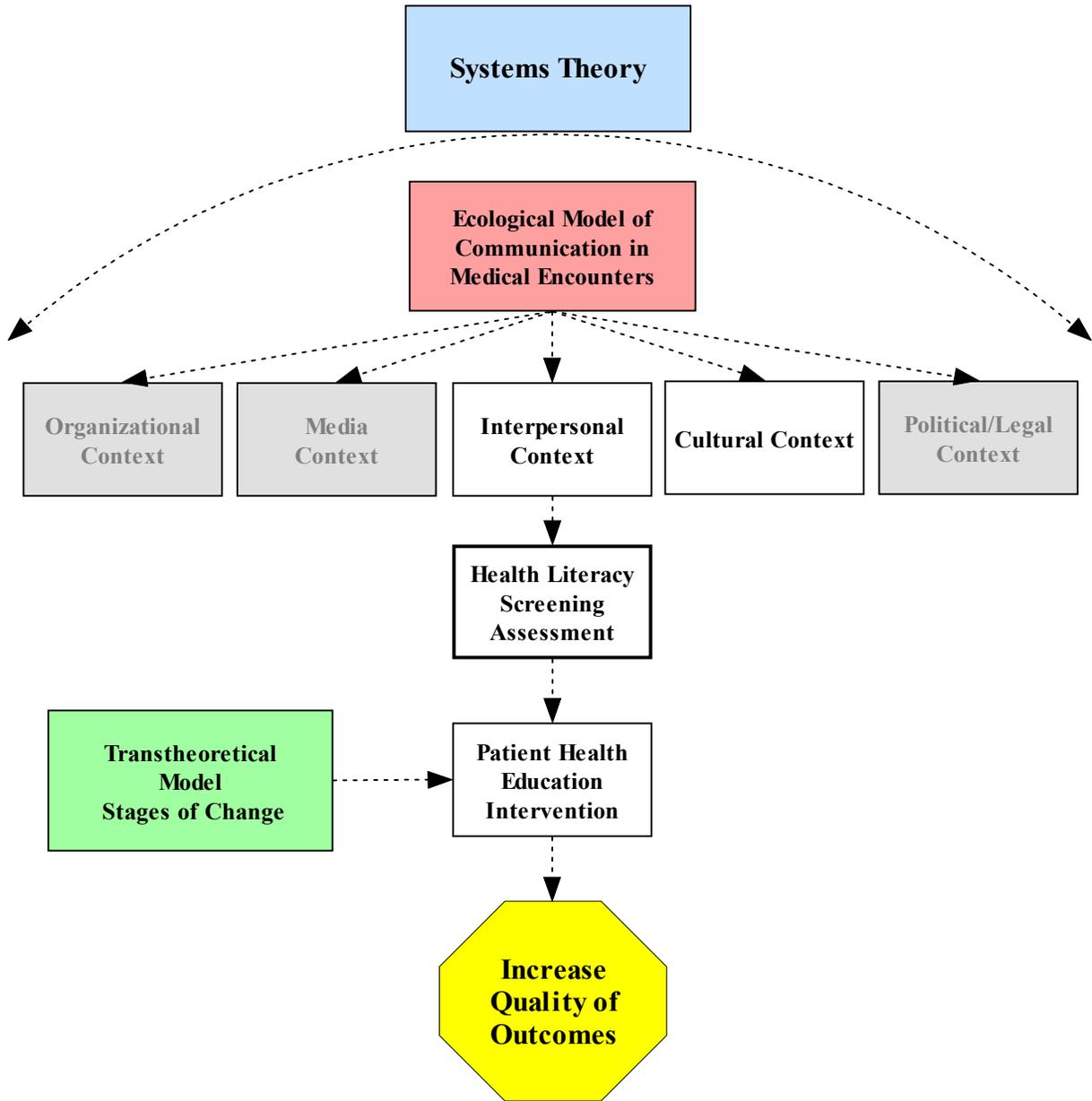


Figure 2-1. Theoretical Framework for Research Study.

CHAPTER 3 METHODOLOGY

The purpose of this study was to (1) validate the BRIEF form health literacy screening process with a VA ambulatory care population; (2) identify relationships between health literacy level and patient variables; and (3) identify stage of behavior for VA patients related to health literacy and patient health education. The research questions for this study include: (1) Does the brief screening correlate with the validated assessments and identify those patients in an ambulatory VA healthcare setting with inadequate health literacy? (2) What patient variables are associated with health literacy level? (3) What is the patients' level of knowledge, readiness and confidence related to health literacy? (4) What is the patients' level of confidence and readiness related to receiving patient health education? The following sections describe the methodology of the study.

Research Design

Sample Population

The correlation analysis required 85 pairs of scores. Based on a power analysis table, a minimum of 225 participants was necessary to conduct the regression analysis, with .30 effect size (medium) and .10 accuracy. Ultimately 378 participants provided data for this study. Data were collected in rural and non-rural settings. The target population for this project was a convenience sample of VA patients presenting for care in a VA ambulatory care setting. Participants were patients in eight ambulatory clinics where trained volunteer data collectors were on staff. Participants were chosen at random by volunteer recruiters; inclusion criteria required the participants to speak English to verbally assent to participate.

Instruments

A self-administered survey and three screening instruments were utilized to collect data for this study. The participant survey instrument consisted of 19-items (See Appendix A). The brief self-administered participant survey had seven demographical items: age, gender, marital status, race/ethnicity, language, home ownership, and education. One item assessed English as a first language. One five-point Likert item (1 = excellent; 5 = poor) asked participants to rate their reading ability. Three additional dichotomous items pertained to health status related to high blood pressure; stroke; and diabetes. Finally, eight questions with five-point Likert scale response options (strongly agree to strongly disagree) gathered data about the participants' ability to define health literacy; awareness of patient education resources; confidence in seeking support related to health information and health literacy; received support and patient education resources; and intention to seek patient education resources and support related to health information.

Two instruments were used to test the proposed BRIEF screening tool: (1) STOFHLA, Short-Test of Functional Health Literacy in Adults (Parker et al., 2001); and (2) The REALM, Rapid Estimate of Adult Literacy in Medicine (Davis et al., 1993).

The STOFHLA is a shortened version of the original TOFHLA (Parker, Baker, Williams, & Nurss, 1995; Nurss, Parker, Williams, & Baker, 2001). STOFHLA is comprised of two prose passages with thirty-six fill-in-the-blank response items worth one point each. The possible score range is 0 – 36. The maximum time for administration is seven minutes. STOFHLA scores divide health literacy skills into three criterion levels: (1) inadequate (0-16); (2) marginal (17-22); and (3) adequate (23-36) (See Appendix B). In a group of 211 patients, Cronbach's alpha for the STOFHLA was 0.97. Spearman's correlation between the STOFHLA and the REALM was 0.80 (Baker, Williams, Parker, Gazmararian, & Nurss, 1999).

The REALM assesses health literacy through the use of three columns of twenty-two words each. The words in each column are listed in ascending order of difficulty. The REALM produces a summed score based on the number of correctly pronounced words in each column. REALM scores range from 0 to 66 (See Appendix C) and are divided into three criterion levels, namely: limited (0 - 44); marginal (45 - 60); and adequate (61 - 66). Davis and colleagues (1993) tested the REALM with three other standardized reading tests to establish instrument validity with a sample of 203 patients: the reading recognition section of the Peabody Individual Achievement Test-Revised (PIAT-R), the Wide Range Achievement Test-Revised (WRAT-R), and the Slosson Oral Reading Test-Revised (SORT-R). The REALM correlated well with the three other tests. Correlation coefficients were 0.97 [PIAT-R], 0.88 [WRAT-R], and 0.96 [SORT-R], ($p < .0001$). To determine test-retest reliability 100 inmates at a state prison were given the REALM twice, one week apart. Test-retest reliability was 0.99, $p < .001$). Intra-subject reliability for REALM has been reported as 0.97 (Davis et al., 1993).

This study employed the BRIEF health literacy screening tool which is comprised of the following four items (See Appendix D): (1) How often do you have someone help you read hospital materials? (2) How confident are you filling out medical forms by yourself? (3) How often do you have a problems learning about your medical condition because of difficulty understanding written information? and (4) How often do you have a problem understanding what is told to you about your medical condition? Response options were offered in a five-point Likert scale for each of the items [items 1, 3 & 4 (1 = always to 5 = never); and item 2 (1 = not at all to 5 = extremely)].

Though the validity of the proposed tool has not been previously published, the individual items have been evaluated to examine their ability to identify individuals with inadequate health

literacy. Chew and colleagues (2004) examined 16 screening questions. In a sample of 332 veteran participants; 15 (4.5%) had inadequate health literacy and 25 (7.5%) had marginal health literacy on the STOHFLA. Three of the screening questions, "How often do you have someone help you read hospital materials?" "How confident are you filling out medical forms by yourself?" and "How often do you have problems learning about your medical condition because of difficulty understanding written information?" were effective in detecting inadequate health literacy; area under the receiver operating characteristic curve of 0.87, 0.80, and 0.76. Wallace and colleagues (2006) continued Chew's (2004) work and tested the three individual items with 305 participants. They computed the area under the receiver operating characteristic curves (AUROC) for each item, using REALM scores as a reference standard. In Wallace's (2006) sample, 54 (17.7%) had limited and 52 (17.0%) had marginal health literacy skills. One screening question, "How confident are you filling out medical forms by yourself?" was accurate in detecting limited (AUROC of 0.82; 95% confidence interval [CI] = 0.77 to 0.86) and limited/marginal (AUROC of 0.79; 95% CI = 0.74 to 0.83) health literacy skills; the item had a significantly greater AUROC than the other questions ($P < .01$).

Based on the findings of Chew, Wallace and their colleagues, three items were included in the proposed BRIEF health literacy screening tool. However, because the Veteran Health System serves a large portion of elderly patients, auditory health information can pose problems for patients who have hearing problems. Thus, the item, "How often do you have a problem understanding what is told to you about your medical condition?" was added in an attempt to increase the construct validity of the tool by addressing the comprehension of oral health information. The addition of this item completed the development of the 4-item BRIEF health literacy screening tool to be validated against the previously published REALM and STOFHLA.

Data Collection

This study was approved as an expedited survey by the University of Florida Institutional Review Board (UFIRB), project number 629-2005. Therefore, this study did not require written consent. Thus data collectors verbally recruited participants and participants verbally consented to participate in the study. This study received cooperation and support from the staff of the Veteran Health System. All data were collected on site at eight Veteran Health System ambulatory care clinics and hospitals in North Florida/South Georgia between March 2006 and August 2006 (See Table 3-1). This study used an action research method using volunteer healthcare providers to collect data in the clinical setting. Volunteer data collectors were recruited via an inter-office email generated by the research study co-investigator, a VA registered nurse (See Appendix E). Data collectors attended a 30-minute training session on site where they were provided with data packet administration instructions, practice opportunities, and materials. Training was provided by the principal investigator.

Participants were recruited by twenty-one trained volunteer data collectors. The majority of data collectors were nurses ($n = 17$), others included the principal investigator; a nutritionist; a dental technician; and a nurse educator volunteer (See Table 3-2). The use of a diverse set of providers enabled a diverse patient sample and demonstrated the use of the BRIEF health literacy screening process in multiple ambulatory care settings. Healthcare providers followed one of two procedures to recruit participants; they either invited participants and collected the data themselves in their ambulatory care setting, or they invited the potential participant to participate and then brought the patient to the investigator's examination room (in the same ambulatory setting). Who collected data from the participants (whether the investigator or the volunteer recruiter/data collector), was determined by convenience for the volunteer recruiter/data collector. Upon meeting the patient, data collectors invited the patient to participate and

answered any of the patient's questions. Once the patient agreed to participate the data collector provided a private exam room for the participant, along with three health literacy screening assessments and one participant survey. All health literacy instruments and the survey required a total of approximately twelve to fifteen minutes of the participant's time. Administration times for the individual instruments are illustrated in Table 3-3. Upon completion of the instruments, the data collector thanked the participant for their information and offered to answer any questions. The data collector then put the completed assessments and participant survey into a manila envelope labeled with the clinician data collector name and site location. The envelopes were then sealed and provided to the study administrator who kept the data stored in a locked cabinet. To ensure confidentiality and anonymity, no identifying information was collected from participants. The study had a response rate of approximately 90%; the reasons for refusal were not assessed and thus cannot be determined. No incentives for participation were provided.

Data Analysis

Data were analyzed using the SPSS© v. 12.0 software package. The level of significance was set at a 95% level of confidence, with a p-value of .05. Univariate statistical analyses included basic descriptive statistics including means, frequencies and proportions to provide preliminary statistical information and assess data patterns (Noland, 2000). Frequency distributions and descriptive statistics were calculated to obtain information about gender; race/ethnicity; education; health status; knowledge; and health literacy level. The following sections provide details of the analyses conducted to answer the four proposed research questions.

Research Question #1

Does the BRIEF screening tool correlate with the STOFHLA & REALM to identify those patients in an ambulatory VA healthcare setting with inadequate health literacy?

Bivariate Analyses. A Pearson Product Moment correlation coefficient was calculated in order to determine the comparative validity of the screening tools. The Pearson Product Moment correlation coefficient is commonly used to analyze the magnitude of association between two or more variables. This study utilized two previously validated health literacy screening tools, the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults (STOFHLA) to test the validity of the proposed instrument, the four item BRIEF. A normal distribution of data and a true linear relationship between variables was assumed.

Upon finding significant correlations between the BRIEF health literacy screening tool and the validated tools, other analyses were run to determine the accuracy of the BRIEF when compared to the REALM and the STOFHLA; and optimal cut-off points for determining varying levels of health literacy. The accuracy of diagnostic tools is typically evaluated using measures such as sensitivity; specificity; predictive values; and likelihood ratios (Espallardo, 2003). Sensitivity is defined as the “proportion of patients who were positive for the test among all patients with the disease” (Espallardo, 2003, p. 229). Specificity is defined as the “proportion of patients who were negative for the test among all patients with the disease” (Espallardo, 2003, p. 229). Positive predictive value is defined as the “proportion of patients with the disease among all patients who were positive for the test” (Espallardo, 2003, p. 230). Negative predictive value is defined as the “proportion of patients who do not have the disease among those patients who were negative for the test.” (Espallardo, 2003, p. 230). “False negative” is defined as the proportion of patients who had a negative test result, but were really positive for the disease. “False positive” is defined as the proportion of patients who had a positive test result, but were

really negative for the disease. These diagnostic concepts are defined and illustrated in Tables 3-4 & 3-5.

This study utilized the measures of “sensitivity” as the primary indicator of accuracy of the BRIEF health literacy screening tool. A perfect health literacy screening test would have 100% sensitivity and 100% specificity. It would accurately identify all the true cases of inadequate/marginal health literacy, and it would never mislabel someone with adequate health literacy as someone with inadequate/marginal health literacy skills. However, this degree of accuracy is rare.

Because most screening tests are imperfect, a balance between sensitivity and specificity is a necessary compromise. To establish the optimal balance, sensitivity and 1-specificity can be plotted on a graph, called a "ROC curve," meaning Receiver-Operator-Characteristic (ROC). The ROC can provide statistical data to determine the optimal cutoff point for demarcating data in diagnostic tests, creating balance between sensitivity and specificity. Pepe (2000) describes the ROC,

A statistical tool that is becoming popular for describing diagnostic accuracy is the receiver operating characteristic (ROC) curve. To define an ROC curve, first consider diagnostic tests with dichotomous outcomes, with positive outcomes suggesting presence of disease. For dichotomous tests, there are two potential types of error. A false-positive error occurs when a non-diseased individual has a positive test result, and conversely, a false-negative error occurs when a diseased individual has a negative test result. The rates with which these errors occur, termed the false-positive and false-negative rates, together constitute the operating characteristics of the dichotomous diagnostic test...ROC curves generalize these notions to non-binary tests in the following fashion: Let D be a binary indicator of true disease status with $D = 1$ for diseased subjects. Let X denote the test result with the convention that larger values of X are more indicative of disease. For any chosen threshold value c , one can define a dichotomous test by the positivity criterion X [greater than or equal to] c and calculate the associated error rates. A plot of 1 minus the false-negative rate (or true positive rate) versus the false-positive rate for all possible choices of c is the ROC curve for X (p. 308).

Receiver operating characteristic (ROC) curves were calculated to plot the sensitivity versus 1-specificity and areas under the ROC curve (AUROC) to test the performance of the BRIEF health literacy screening items.

Finally, to test independence between the proposed score intervals, an analysis of variance (ANOVA) was conducted for the health literacy screening tools. An ANOVA was also conducted to test for group differences between the proposed BRIEF score levels. These analyses were conducted to determine if the four item BRIEF assessment could improve the detection capability of the previously recommended single health literacy screening items and to identify score intervals for clinical interpretation (Chew, Bradley & Boyko, 2004; Wallace, Rogers, Roskos, Holiday & Weiss, 2006).

An ANOVA is an inferential statistic; it can be used with more than one independent variable, each of which must include at least two levels. The ANOVA procedure is appropriate for experiments with more than one independent variable including more than two levels for each independent variable (Weaver, 2003, para. 1; BBN Corporation, 1997, para 5). An ANOVA compares the variance of scores within a set parameter. The variance of levels produces the sum of squares within groups (SS_{wg}), and sum of squares between groups (SS_{bg}). Variation in overall mean values is due to factor or to variation due to random error. The ANOVA model presented in Figure 3-1, provided, μ = the overall mean, τ_i = the level effect, and ϵ_{ij} = the random error component.

Multivariate Analyses. A Principal Component Analysis was conducted to determine if the BRIEF in fact measures one distinct construct - "health literacy." Principle component analysis is an analysis of interdependence, which "allow(s) the researcher to reorient the data so the first few dimensions account for as much of the available information as possible" (Lattin, Carroll, &

Green, 2003, p. 83). A Principal Component Analysis informs us on how much of the variance is accounted for by the identified principal components yielding in a given analysis (Lattin, Carroll, & Green, 2003). Linear combinations of the original variables (i.e. BRIEF items) are replaced with standardized variables. By function, the analysis produces weighted eigenvectors associated with the covariance matrix of the standardized versions of the original variables. The variance of the principal components is produced by the eigenvalues associated with the eigenvectors. Principal components are typically identified using the calculated eigenvalues. Kaiser's rule suggests, "retaining only principal components with eigenvalues exceeding unity," suggesting only principal components with eigenvalues greater than one should be retained (Lattin, Carroll, & Green, 2003, p. 113).

Research Question #2

What patient variables are associated with health literacy level in an ambulatory VA healthcare setting?

Multivariate Analyses. A Stepwise multiple linear regression analysis was conducted, with dummy coded variables, to determine predictors of the dependent variable health literacy, including several independent variables: six socio-demographic variables (age, education level, gender, ethnicity, perceived ability to read and perceived ability to define "health literacy") and three health status variables (diabetes, stroke, high blood pressure). A multiple regression model can be used with multiple explanatory variables and a continuous outcome variable, as in the BRIEF health literacy screening tool.

Multiple regression is commonly used to predict and understand the relationship between an outcome variable and several independent variables (StatSoft, 2006). In areas of inconclusive research, such as health literacy, stepwise regression is a popular method to explore and determine predicting independent variables. This analysis identifies the independent variables (age, gender, socio-economic level, etc.) which account for variance in the dependent variable

(health literacy level), while controlling for other independent variables (Rosner, 2000).

Stepwise multiple regression analysis computes the ordinary least squares to determine the best linear combination of independent variables which predict the dependent variable. The equation for the multiple regression statistic is illustrated in Figure 3-2. Ultimately, Stepwise multiple regression computes the best fit of the regression line.

Where Y is the dependent variable and " $\delta_1Z_1 + \delta_2Z_2 + \delta_3Z_3$ " are the independent variables, the "b's" are regression coefficients, which represent the change in the dependent variable (y) when the independent variable changes one unit; the "c" is the constant. Error is assumed in multiple regression; multivariate normality and relationship linearity is observed.

Research Question #3

What is the patients' level of knowledge, readiness & confidence related to health literacy in an ambulatory VA healthcare setting?

Univariate statistical analyses calculated frequencies and proportions to provide statistical information about the participants' reported level of knowledge and confidence related to health literacy and health information. Univariate statistical analyses can be used to illustrate statistical information and to identify data patterns (McDermott & Sarvela, 1999; Noland, 2000).

Research Question #4

What is the patients' level of confidence and readiness related to receiving patient health education in an ambulatory VA healthcare setting?

As with Research Question # 3, to answer the fourth and final research question in this study univariate statistical data analyses were conducted to calculate frequencies and proportions to provide information about the participants' readiness & confidence related to patient health education. As stated previously, univariate analyses are commonly used to illustrate statistical data patterns (McDermott & Sarvela; Noland).

Instrument Reliability

The instrument reliability was calculated for the proposed BRIEF health literacy screening tool (See Appendix D) based on the study sample data using Cronbach's (1955) alpha measure of internal consistency (Traub, 1994). Cronbach's alpha is commonly used to assess the reliability of an instrument using an item analysis. To determine the benefit of adding the fourth item (How often do you have a problem understanding what is told to you about your medical condition?) a reliability analysis was conducted with three and four items resulting in the following respective alpha levels: BRIEF with 3-items, $\alpha = .722$ and BRIEF with 4-items, $\alpha = .773$. These statistical findings suggest that adding the fourth item to the BRIEF screening tool increases the internal consistency of the construct measure.

Summary

Chapter three describes the methods used to answer the four research questions posed in this study. The proposed methods examined the relationships between demographical variables and health literacy and tested the proposed BRIEF health literacy screening tool against the validated REALM and STOFHLA instruments. Chapter three includes a description of the sample population, data collection, instruments, research design, research variables, and data analysis procedures. Frequency rates were calculated to determine participant stage of readiness related to patient education and health literacy. A Pearson's Product Moment correlation was conducted to test the association, and comparative validity of the screening tools. A Principal Component Analysis was conducted to determine the number of distinct constructs measured by the BRIEF health literacy screening tool. Receiver operating characteristic (ROC) curves were calculated to plot the sensitivity versus 1-specificity and areas under the ROC curve (AUROC) to test the performance of the BRIEF health literacy screening tool. An Analysis of Variance (ANOVA) was also conducted to test group differences among the proposed score intervals.

Finally, a stepwise multiple linear regression analysis was conducted to determine predictors of the dependent variable, health literacy. Analyses for the research questions were tested at a .05 significance level. The following chapter discusses results from these analyses.

Table 3-1. Frequency and percentage of participants recruited at the eight VA ambulatory care sites.

Site #	VA VISN 8 Sites	Frequency	Percent (%)
1	Gainesville, FL	244	64.6
2	Valdosta, GA	5	1.3
3	Lacanto, FL	3	.8
4	St. Augustine, FL	6	1.6
5	Leesburg, FL	18	4.8
6	Tallahassee, FL	55	14.6
7	Lake City, FL	37	9.8
8	The Villages, FL	10	2.6
	Total	378	100.0

Table 3-2. Frequency and percentage of participant data collected by each of the volunteer data collectors.

Site #	Data Collector	Frequency	Percent (%)
1	Principal Investigator	158	41.8
1	Nurse Collector #1	5	1.3
1	Nurse Collector #2 (Co-PI)	39	10.3
1	Nurse Educator Volunteer	38	10.1
1	Nurse Collector #3	3	.8
1	Nurse Collector #4	1	.3
2	Nurse Collector #5	5	1.3
3	Nurse Collector #6	3	.8
4	Nurse Collector #7	6	1.6
5	Nurse Collector #8	6	1.6
5	Nurse Collector #9	8	2.1
5	Nurse Collector #10	4	1.1
6	Nurse Collector #11	11	2.9
6	Nurse Collector #12	10	2.6
6	Nurse Collector #13	9	2.4
6	Nurse Collector #14	15	4.0
6	Nurse Collector #15	10	2.6
7	Nutritionist	9	2.4
7	Dental Technician	3	.8
7	Nurse Collector #16	25	6.6
8	Nurse Collector #17	10	2.6
	Total	378	100.0

Table 3-3. Administration time for the REALM, STOFHLA, BRIEF, & Participant Survey.

Instrument	Time to Administer (minutes)
REALM	4
STOFHLA	7
BRIEF	2
Participant Survey	5

Table 3-4. Conceptual illustration of the sensitivity, specificity, false positive, false negative, positive predictive value, and negative predictive value.

		Health Literacy Status		
		Inadequate/Marginal (Positive)	Adequate (Negative)	
Test Result	Positive	a (true positive)	b (false positive)	a+b
	Negative	c (false negative)	d (true negative)	c+d
		a+c sensitivity	b+d specificity	

Table 3-5. Definitions and equations of sensitivity, specificity, false positive, false negative, positive predictive value, and negative predictive value.

Term	Equation	Definition
Sensitivity	$a/(a+c)$	proportion of patients who were positive for the test among all patients with the disease
Specificity	$d/(b+d)$	proportion of patients who were negative for the test among all patients with the disease
False negative	$c/(a+c)$ or $(1 - \text{sensitivity})$	proportion of patients who had a negative test result, but were really positive for the disease
False positive	$b/(b+d)$ or $(1 - \text{specificity})$	proportion of patients who had a positive test result, but were really negative for the disease
Positive Predictive Value	$a/(a+b)$	Probability the patient has the disease, when test results indicate positive for disease
Negative Predictive Value	$d/(c+d)$	Probability the patient does not have the disease, when test results indicate negative for disease

$$y_{ij} = \mu + \tau_i + \epsilon_{ij}$$

Figure 3-1. Analysis of Variance (ANOVA) Equation Model.

$$Y = b_1x_1 + b_2x_2 \dots + b_nx_n + c$$

Figure 3-2. Multiple Linear Regression Model.

CHAPTER 4 RESULTS

The level of significance was set at a 95% confidence level, with an alpha of .05. Basic descriptive statistics including frequencies and proportions are presented. The demographic statistics are illustrated in Table 4-1. Participants were predominantly white (73.5%) males (94.2%). The mean age was 61.5 (SD = 11.9) years. Mean age by ethnicity was: whites, 62.7 years (SD = 11.4); African Americans, 56.7 years (SD = 12.1); Hispanics, 61.9 (SD = 12.6); and Native Americans, 68.6 (SD = 11.4). The sample consisted of 278 (73.5%) white participants; with 69 (18.3%) African Americans; 12 (3.2%) Hispanics; 12 (3.2%) Native Americans; 1 (.3%) Asian American; and 1 (.3%) self-described as “other.” Three (.8%) participants did not provide their ethnicity. Though the veteran population is diversifying, this sample is representative of the current veteran population receiving Veteran Health System services.

In addition to measuring health literacy level, participants rated their reading ability (five-point scale). Nearly 86% report reading “good” to “very good” while 15% reported reading “fair” or “poor” (See Table 4-2). Ninety-seven % (366) of participants report speaking English as their first language. Seventy-seven % (290) of participants reported owning their home. Sixty-four % (242) of respondents reported having high blood pressure; 35% (132) reported having diabetes; and 11% reported having had at least one stroke.

Research Questions

Research Question # 1

Does the BRIEF screening tool correlate with the STOFHLA & REALM to identify those patients in an ambulatory VA healthcare setting with inadequate health literacy?

To illustrate the levels of health literacy in the sample population participant health literacy scores for each of the three tools were calculated and then categorized into three groups:

REALM: limited (0 - 44); marginal (45 - 60); adequate (61 - 66); STOFHLA: inadequate (0 - 16); marginal (17 - 22); adequate (23 - 36); and the proposed BRIEF: inadequate (4 - 12); marginal (13 - 16); adequate (17 - 20). Data are provided in Table 4-3. The participants' scores spanned the full range of possible scores: 4-Item Brief (5-20); REALM (0-66); and STOFHLA (0-36).

Scores from the three screening tools (BRIEF, REALM, & STOFHLA) suggest between 7% and 20% of respondents had inadequate health literacy skills and between 8% and 37% had marginal health literacy skills and between 43% and 83% had adequate health literacy skills. The average scores for the three screening tools were as follows (standard deviation in parentheses): BRIEF = 15.39 (SD = 3.67); REALM = 59.42 (SD = 8.96); and STOFHLA = 29.83 (SD = 8.03), respectively (See Figure 4-1). These data suggest the average individual has marginal health literacy skills as measured by the REALM and BRIEF; and adequate as measured by the STOFHLA. Cross tabulation tables illustrate the BRIEF, REALM, & STOFHLA data in Tables 4-4 & 4-5.

A Pearson Product Moment correlation was calculated to determine the comparative validity of the screening tools (See Table 4-6). Pearson correlation results were: $r(378) = .40, p < .01$ for the BRIEF and REALM; $r(378) = .42, p < .01$ for the BRIEF and STOFHLA; and $r(378) = .61, p < .01$ for the REALM and STOFHLA. The coefficients provide evidence that all three of the health literacy screening tools are positively correlated. These correlations suggest patients scoring high on one tool will also score high on the other two tools. The addition of the fourth item to the BRIEF, "How often do you have a problem understanding what is told to you about your medical condition?" did increase the internal validity of the screening measure as indicated by the increased correlation coefficient (See Table 4-6). A general rule of thumb for

determining if there is a relationship between variables is a minimum correlation coefficient of at least .30 (Hinkle, Wiersma, & Jurs, 1988). With this in mind, a significant correlation exists between the BRIEF, the REALM and the STOFHLA. Franzblau (1958) provides a more precise scale of correlation coefficients for determining the degree of a correlational relationship: .00 - .20 = no or negligible correlation; .20 - .40 = low degree of correlation; .40 - .60 = moderate degree of correlation; .60 - .80 = marked degree of correlation; and .80 - 1.00 = high correlation. According to Franzblau's (1958) standards the association between the BRIEF and the validated tools is moderate. To further demonstrate the construct validity of the BRIEF, the Principal Component Analysis findings suggest the BRIEF health literacy screening tool measures one distinct construct - "health literacy" (eigenvalue = 2.388) accounting for 60% of score variance. The remaining eigenvalues were less than one, and thus were not retained. These findings validate the BRIEF as a health literacy screening tool as compared to the REALM and STOFHLA.

The area under the ROC for the individual screening items and the BRIEF were calculated for detecting individuals with inadequate/marginal health literacy skills using the STOFHLA and REALM as state variables. "State" variables are recognized as the "true" indicator of presence of "disease" when comparing screening tools using the ROC method. AUROC curves, including confidence intervals and sensitivity, were calculated to indicate the degree to which the BRIEF would identify respondents with (1) inadequate health literacy skills; versus (2) inadequate/marginal health literacy skills. The REALM and STOFHLA served as the state variables. Using the REALM as the state variable, the BRIEF had a slight increase in accurately identifying individuals with inadequate health literacy, .79 (95% CI = .70-.87), versus inadequate and marginal, .69 (95% CI = .64-.75), respectively. Again, using the REALM as the state

variable, the BRIEF screening tool had a higher AUROC than any of the single BRIEF items, indicating the BRIEF screening tool was a more sensitive screening tool for identifying inadequate health literacy skills than the single items (See Table 4-7). With the STOFHLA as the state variable, findings indicate the BRIEF items identify individuals with inadequate health literacy skills, .76 (95% CI = .69-.83) with slightly more accuracy than individuals with inadequate or marginal health literacy skills 74 (95% CI = .67-.80). All of the items had an AUROC greater than 0.5 at 95% CI. The BRIEF had a higher AUROC than any of the single items, indicating the BRIEF is a better screening tool than the single items (See Table 4-8). Figures 4-2, 4-3, 4-4, and 4-5 illustrate the AUROC curve for the BRIEF in identifying individuals with inadequate and inadequate/marginal health literacy using the STOFHLA as the state variable. Figures 4-6, 4-7, 4-8, and 4-9 illustrate the AUROC curve for the BRIEF in identifying individuals with inadequate and inadequate/marginal health literacy using the REALM as the state variable. Sensitivities and 1-specificities for the BRIEF using the REALM and STOFHLA as state variables are shown in Tables 4-9 & 4-10.

Based on previous research (Chew et al., 2004; Wallace et al., 2006) and the statistical findings, three levels are recommended for interpreting BRIEF score intervals: 4-12 = inadequate; 13-16 = marginal; and 17-20 = adequate. Additionally, an Analysis of Variance (ANOVA) was conducted to determine if the group differences for the score intervals were significant – to further validate the proposed scoring intervals. Findings indicate the three proposed BRIEF levels were significantly different from one another on the REALM ($F = 28.63$, $p < .000$) and STOFHLA ($F = 35.32$, $p < .000$). Post Hoc Tukey analyses suggests all levels were significantly different from one another on the REALM and STOFHLA at $p < .00$.

Research Question # 2

What patient variables are associated with health literacy level in an ambulatory VA healthcare setting?

A step-wise multiple regression analysis was conducted, with dummy coded variables, to examine the degree of association between the outcome variable (STOFHLA) and the explanatory variables, including socio-demographic variables (age, education level, gender, ethnicity, perceived reading ability and perceived ability to define “health literacy”) and health status variables (diabetes, stroke, high blood pressure). Gender and socio-economic status was originally included however they were ultimately excluded from the final analysis. Because the sample population was predominantly male (94.2%) gender was excluded from the regression analysis. Further the socio-economic variable was deemed unsuitable due to the item, which inquired about the participants’ ownership of his/her home rather than income level. Further the inclusion of these two variables in the preliminary analysis did not glean any significant findings.

Findings indicate the R^2 of .34 was statistically significant, $F(7, 357) = 26.23, p < .000$, suggesting the explanatory variables: age, perceived reading ability, educational level, ethnicity, perceived ability to define “health literacy,” and reporting having Diabetes were jointly associated with 34% of the STOFHLA score variance. The interpretation of the unstandardized regression coefficients of the statistically significant explanatory variables are as follows. For each unit increase in STOFHLA score the participants’ age decreased by 1.72 years ($b = -1.72, t(357) = -4.50, p = .000$); perceived reading ability increased .21 units ($b = .21, t(357) = 6.90, p = .000$); and educational level increased 1.2 units ($b = 1.20, t(357) = 3.59, p = .000$). Perceived ability to define “health literacy” was associated with higher health literacy scores on the STOFHLA ($b = .99, t(357) = 2.48, p = .013$). Being African American ($b = -2.76, t(357) = -3.01, p = .003$) or Hispanic ($b = -4.65, t(357) = -2.31, p = .022$) was associated with lower health

literacy scores. Interestingly, African Americans were the youngest group (56.7 years) with Native Americans being the eldest (68.6 years), white participants were the second eldest group (62.7 years); the Hispanic participants had a mean age of 61.9 years. These findings should be interpreted with caution due to the small sample sizes by ethnic orientation. Further, having diabetes was associated with lower health literacy scores ($b = 1.56, t(357) = 2.16, p = .031$). Whether inadequate health literacy resulted in their diabetic condition cannot be determined.

Research Question # 3

What is the patients' level of knowledge, readiness & confidence related to health literacy in an ambulatory VA healthcare setting?

To answer the third research question a univariate statistical analysis was conducted. Frequencies and proportions were calculated to examine participant responses to survey items related to their level of knowledge, readiness & confidence related to health literacy. The majority (65.9%) of participants reported they were able to define "health literacy." However, participants were not required to provide a definition or demonstrate their knowledge of health literacy. Further, 21.5% of participants reported they were neutral in feeling as if they could define health literacy and 12.7% strongly disagreed with the statement. The majority of participants felt confident in their ability to seek support related to health literacy (86.9%); of the remaining participants 9.1% were neutral and 4.1% disagreed. Eighty-four % of participants reported receiving support with health information; while nearly 10% were neutral, and 6.1% disagreed. Eighty-seven % intended to seek support related to health information in the future; 10.4% were neutral, and 2.1% disagreed. Frequencies and proportions are illustrated in Table 4-12.

Research Question # 4

What is the patients' level of confidence and readiness related to receiving patient health education in an ambulatory VA healthcare setting?

Univariate statistical analysis was conducted to answer the final research question. Frequencies and proportions were calculated to examine participant responses to survey items related to their readiness & confidence related to patient health education. The majority (77.2%) of participants is aware of health education resources that are available to them; 14.2% are neutral, and 8.6% are not aware of available resources. Eighty-one % of participants report having received health education resources in their lifetime; 11.55% were neutral, and 7.2% had not received any resources. However participants did not report which resources they were aware of or what health education resources they had received.

The majority of participants were confident in their ability to seek patient health education (89.8%); 6.7% were neutral and 3.5% disagreed. Nearly 86% intend to seek patient health education resources in the future; while 11.3% were neutral, and 3% do not intend to seek resources. The meaning of the terms “ability to seek,” “intention to seek,” “patient health education resources” and “future” was subject to participants’ interpretation, as definitions were not provided. These findings suggest the majority of participants have received patient health education and are confident in their ability to seek patient health education. Frequencies and proportions are illustrated in Table 4-13.

Summary

This chapter reports findings from the participant survey and the health literacy screening tools. A population profile was illustrated; most veteran participants were older white males. Findings suggest between 7% to 20% of respondents self-report inadequate health literacy skills and between 8% to 37% demonstrate marginal health literacy skills and between 43% to 83%

possess adequate health literacy skills. Bivariate analysis indicates a significant correlation among all three screening tools. The BRIEF tool was able to identify individuals with inadequate and marginal health literacy skills. However the tool has higher sensitivity (accuracy) when identifying individuals with inadequate health literacy, rather than those with adequate health literacy. Multivariate analysis indicated demographic variables were jointly associated with 34% of the STOFHLA score variance. Finally, univariate statistics suggest the majority of participants were knowledgeable about health literacy and health education; confident in their ability to seek support; and had received support related to health literacy and patient health education. Chapter 5 presents a discussion and recommendations from the study for future research in the field of health literacy and patient education.

Table 4-1. Demographical distribution by age, gender, education, and ethnicity.

Demographical Variables	N
Gender	
Male	356 (94.2%)
Female	19 (5%)
Missing	3 (.8%)
Age	
Range	23-89
Average	61.5 (SD=11.9)
Education	
	N(%)
Elementary School (Grades 1 st - 5 th)	4 (1.1)
Junior High School (Grades 6 th - 8 th)	11 (2.9)
Some High School (Grades 9 th - 12 th)	56 (14.9)
High School/GED	98 (25.9)
Some College	126 (33.3)
College Degree	80 (21.2)
Trade School	1 (.3)
Missing	2 (.5)
Total	378
Ethnicity	
African American	69 (18.3)
White	278 (73.5)
Hispanic	12 (3.2)
Native American	12 (3.2)
Asian American	1 (.3)
Other	3 (.8)
Missing	3 (.8)
Total	378

Table 4-2. Frequency of participants' self reported reading ability.

Perceived Reading Ability	(%)
Excellent	95 (25.1%)
Very Good	113 (29.9%)
Good	113 (29.9%)
Fair	42 (11.1%)
Poor	13 (3.4%)
Total	376

Table 4-3. Participants' level of health literacy as measured by the BRIEF, REALM, & STOFHLA.

Health Literacy Level	BRIEF N (%)	REALM N (%)	STOFHLA N (%)
Inadequate	76 (20.1)	25 (6.6)	34 (9.0)
Marginal	138 (36.5)	113 (29.9)	29 (7.7)
Adequate	164 (43.4)	240 (63.5)	315 (83.3)
TOTAL	378	378	378

Table 4-4. Cross tabulation table for BRIEF and STOFHLA levels for sample data.

STOFHLA Levels	BRIEF Levels			Total
	Inadequate	Marginal	Adequate	
Inadequate	17	13	4	34
Marginal	10	14	5	29
Adequate	49	111	155	315
Total	76	138	164	378

Table 4-5. Cross tabulation table for BRIEF and REALM levels for sample data.

REALM levels	BRIEF Levels			Total
	Inadequate	Marginal	Adequate	
Inadequate	15	9	1	25
Marginal	31	49	33	113
Adequate	30	80	130	240
Total	76	138	164	378

Table 4-6. Pearson Product Moment correlation coefficients between the REALM, STOFHLA, & BRIEF Item Scores.

	N	BRIEF Item #1	BRIEF Item #2	BRIEF Item #3	BRIEF Item #4	BRIEF All Items
STOFHLA	378	.32	.42	.28	.28	.42
REALM	378	.34	.38	.28	.21	.40

Table 4-7. Areas under the receiver operating characteristic curve for BRIEF and BRIEF items with REALM as the state variable.

Test Variable(s)	Inadequate	Inadequate & Marginal
BRIEF	.79 (.70-.87)	.69 (.64-.75)
BRIEF Item #1	.73 (.62-.84)	.63 (.57-.69)
BRIEF Item #2	.71 (.59-.84)	.68 (.63-.74)
BRIEF Item #3	.69 (.59-.79)	.65 (.59-.70)
BRIEF Item #4	.68 (.58-.78)	.59 (.53-.65)

Table 4-8. Areas under the receiver operating characteristic curve for BRIEF and BRIEF items with STOFHLA as the state variable.

Test Variable(s)	Inadequate	Inadequate & Marginal
BRIEF	.76(.69-.83)	.74 (.67-.80)
BRIEF Item #1	.66(.56-.77)	.64 (.56-.72)
BRIEF Item #2	.75(.65-.84)	.69 (.61-.77)
BRIEF Item #3	.65(.56-.74)	.66 (.59-.73)
BRIEF Item #4	.68(.59-.78)	.66 (.59-.74)

Table 4-9. Performance of BRIEF in detecting inadequate and marginal health literacy using STOFHLA as the state variable.

BRIEF Scores	Inadequate Health Literacy		Inadequate and Marginal Health Literacy	
	Sensitivity	1 - Specificity	Sensitivity	1 - Specificity
3	0.00	0.00	0.00	0.00
5	0.03	0.02	0.02	0.02
6.5	0.15	0.02	0.08	0.02
7.5	0.15	0.02	0.10	0.02
8.5	0.18	0.04	0.13	0.04
9.5	0.21	0.06	0.19	0.05
10.5	0.24	0.08	0.21	0.08
11.5	0.35	0.12	0.32	0.11
12.5	0.50	0.17	0.43	0.16
13.5	0.59	0.24	0.52	0.22
14.5	0.74	0.33	0.63	0.31
15.5	0.79	0.41	0.78	0.38
16.5	0.88	0.54	0.86	0.51
17.5	0.97	0.65	0.92	0.63
18.5	1.00	0.75	0.95	0.74
19.5	1.00	0.83	0.97	0.83
21	1.00	1.00	1.00	1.00

Table 4-10. Performance of BRIEF in detecting inadequate and marginal health literacy using REALM as the state variable.

BRIEF Scores	Inadequate Health Literacy		Inadequate and Marginal Health Literacy	
	Sensitivity	1 - Specificity	Sensitivity	1 - Specificity
3	0.00	0.00	0.00	0.00
5	0.04	0.01	0.03	0.01
6.5	0.12	0.02	0.06	0.01
7.5	0.16	0.02	0.07	0.01
8.5	0.16	0.05	0.09	0.03
9.5	0.20	0.07	0.14	0.04
10.5	0.24	0.09	0.17	0.05
11.5	0.44	0.12	0.25	0.08
12.5	0.60	0.17	0.33	0.13
13.5	0.72	0.24	0.44	0.17
14.5	0.76	0.34	0.58	0.25
15.5	0.84	0.42	0.65	0.33
16.5	0.96	0.54	0.75	0.46
17.5	0.96	0.66	0.82	0.60
18.5	0.96	0.76	0.88	0.72
19.5	0.96	0.84	0.90	0.82
21	1.00	1.00	1.00	1.00

Table 4-11. Stepwise Model: Unstandardized Coefficients, Standardized Regression Coefficients, t-test Statistics, and Partial r-squares.

Variables	<i>b</i>	Std Error	β	<i>t</i>	<i>p</i>
Intercept	43.75	2.89		15.14	.000
Age	-1.72	.38	-.23	-4.50	.000
Perceived reading ability	.21	.03	.32	6.90	.000
Educational level	1.20	.33	.17	3.59	.000
African American	-2.76	.92	-.14	-3.01	.003
Perceived ability to define “health literacy”	.99	.40	.12	2.48	.013
Hispanic	-4.65	2.01	-.10	-2.31	.022
Diabetes	1.56	.72	.09	2.16	.031

Table 4-12. Frequencies and proportions of participant responses to items about health literacy and health information.

Participants reported they...	Agree	Neutral N (%)	Disagree
...were able to define “health literacy.”	245 (65.9)	80 (21.5)	47 (12.7)
...were confident in their ability to seek health literacy support.	324 (86.9)	34 (9.1)	15 (4.1)
...have received support regarding health information.	314 (84.0)	37 (9.9)	23 (6.1)
...intended to seek support related to health information in the future.	327 (87.4)	39 (10.4)	8 (2.1)

Table 4-13. Frequencies and proportions of participant responses to items about their knowledge, readiness & confidence related to patient health education.

Participants reported they...	Agree	Neutral N (%)	Disagree
...were aware of health education resources.	288 (77.2)	53 (14.2)	32 (8.6)
...were confident in their ability to seek health education support.	336 (89.8)	25 (6.7)	13 (3.5)
...have received health education resources.	303 (81.2)	43 (11.5)	27 (7.2)
...intended to seek patient health education resources in the future.	319 (85.8)	42 (11.3)	11 (3.0)

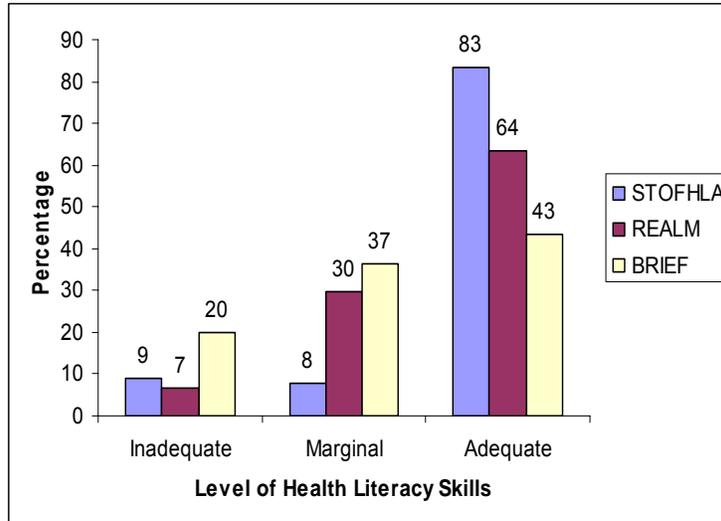


Figure 4-1. Participants' level of health literacy as indicated by the BRIEF, REALM, & STOFHLA.

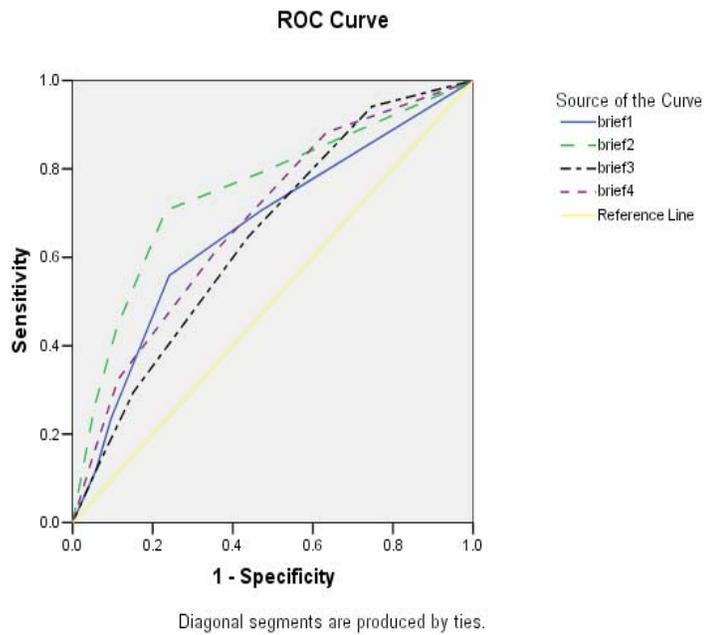


Figure 4-2. The individual BRIEF items for identification of inadequate health literacy using the Receiver Operating Characteristic (ROC) Curves with STOFHLA as the state variable.

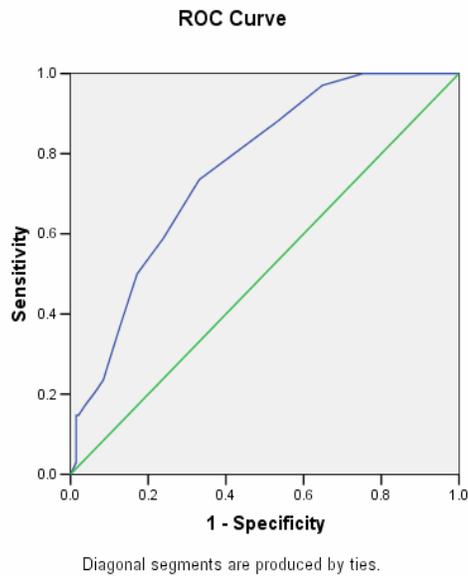


Figure 4-3. The BRIEF health literacy assessment for identification of inadequate health literacy using the Receiver Operating Characteristic (ROC) Curve with STOFHLA as the state variable.

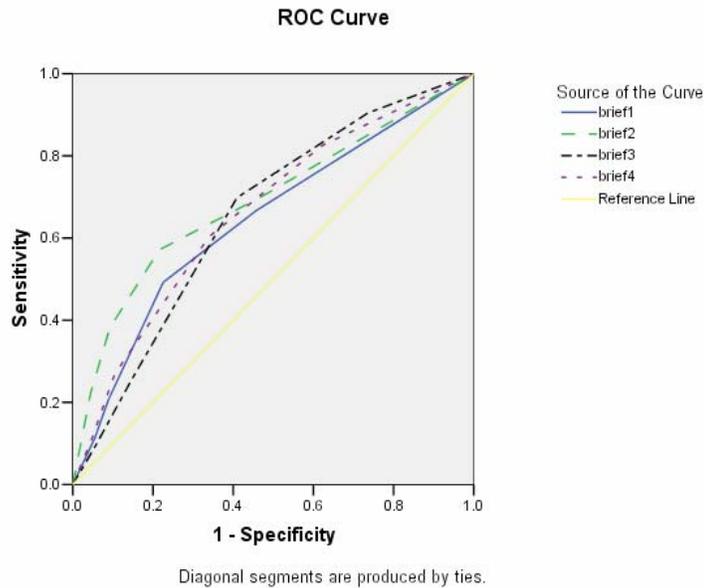


Figure 4-4. The individual BRIEF items for identification of inadequate and marginal health literacy using the Receiver Operating Characteristic (ROC) Curves with STOFHLA as the state variable.

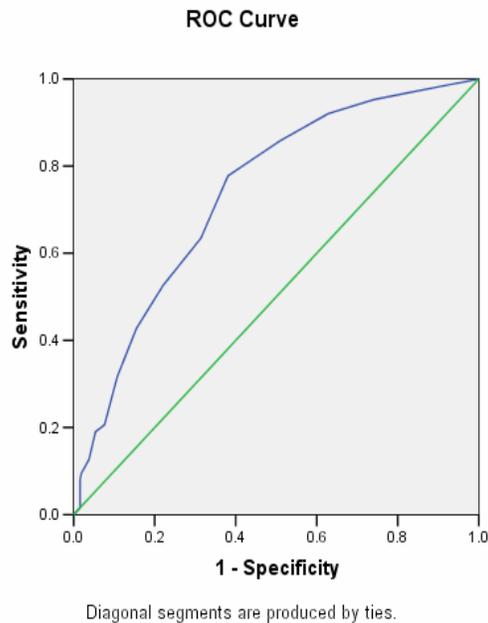


Figure 4-5. The BRIEF health literacy assessment for identification of inadequate and marginal health literacy using the Receiver Operating Characteristic (ROC) Curve with STOFHLA as the state variable.

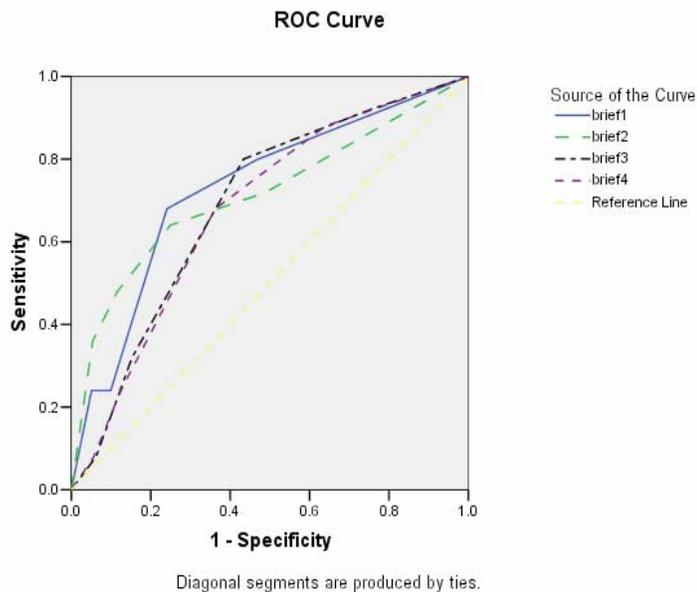


Figure 4-6. The individual BRIEF items for identification of inadequate health literacy using the Receiver Operating Characteristic (ROC) Curves with REALM as the state variable.

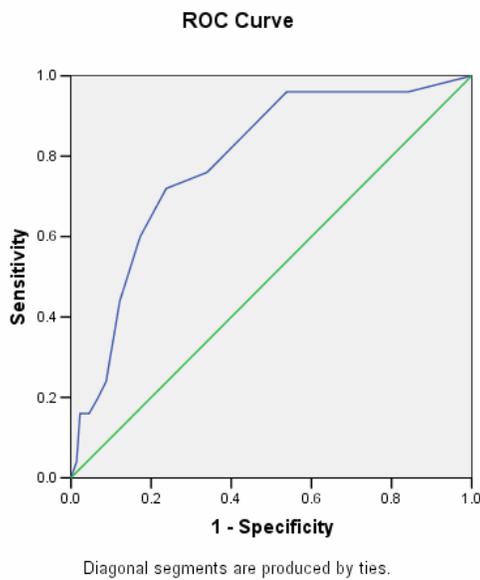


Figure 4-7. The BRIEF health literacy assessment for identification of inadequate health literacy using the Receiver Operating Characteristic (ROC) Curve with REALM as the state variable.

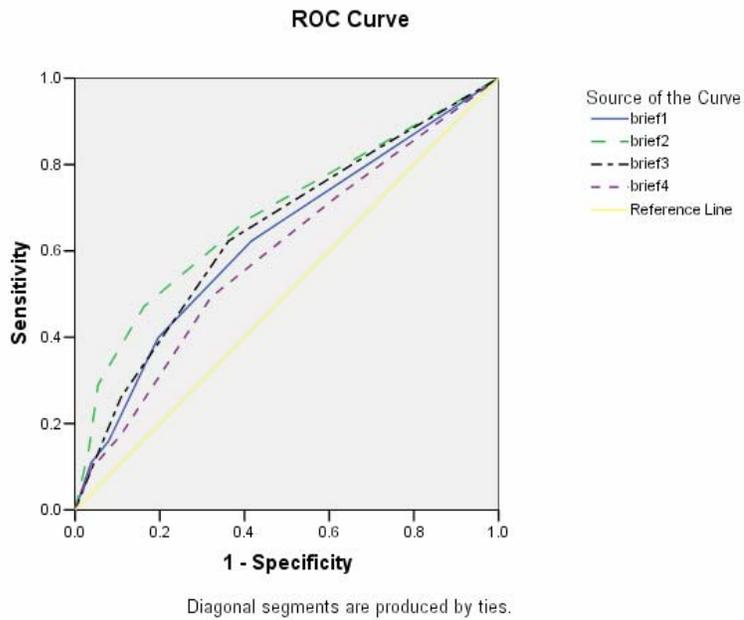


Figure 4-8. The individual BRIEF items for identification of inadequate and marginal health literacy using the Receiver Operating Characteristic (ROC) Curves with REALM as the state variable.

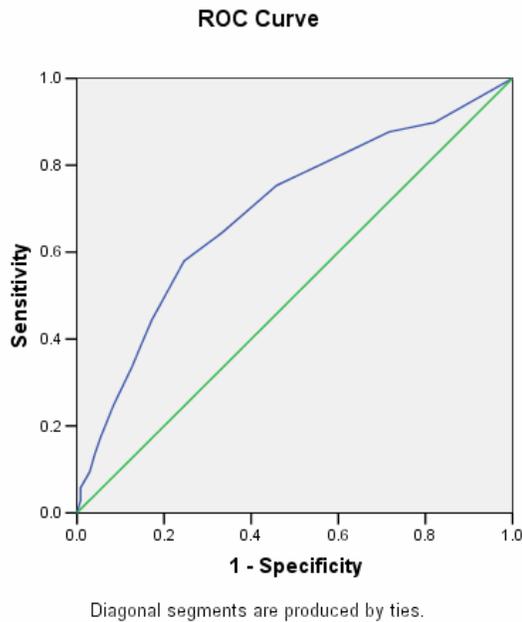


Figure 4-9. The BRIEF health literacy assessment for identification of inadequate and marginal health literacy using the Receiver Operating Characteristic (ROC) Curve with REALM as the state variable.

CHAPTER 5 SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Summary

The purpose of this study was to establish a means for clinicians and health educators to quickly screen patients for inadequate/marginal health literacy and to determine if there were explanatory variables associated with one's health literacy level. Data was also collected to determine the participants' awareness of health literacy; their awareness of health education; and their readiness to utilize health education. This study was conducted with a predominantly male veteran population in an ambulatory clinical care setting within the Veteran Health System in North Florida/South Georgia.

The protocol utilized two validated health literacy screening assessments: Rapid Estimate of Adult Literacy in Medicine (REALM) and Test of Functional Health Literacy in Adults, short form (STOFHLA) to investigate the proposed BRIEF screening tool. A self-administered survey was also used to collect participant data. Findings indicate the BRIEF is significantly correlated with the REALM and STOFHLA and thus can be utilized as a valid measure of health literacy. Clinicians and health educators can use the BRIEF screening tool to quickly identify patients with inadequate health literacy. Further, several demographic and personal variables were significantly associated with health literacy level, including age, ethnicity, educational level, and diabetic condition. These personal characteristics can be used as potential indicators of inadequate health literacy. These findings also have implications for identifying and responding to priority populations when developing intervention efforts. Findings indicate the majority of participants were knowledgeable about health literacy and health education; confident in their ability to seek support; and had received support related to health literacy and patient health education. However, findings also indicate a significant portion of the population are not aware

of health literacy and are not aware of the patient health education resources that are available to them. These findings, their implications and limitations are further discussed in the following sections.

Discussion

Health literacy is a national health issue, affecting one in three Americans and costing the healthcare system billions of dollars annually. An individual's level of health literacy affects how he/she navigates the healthcare process, communicates with healthcare providers, manages health issues, and adheres to a healthcare regimen. The outcomes of inadequate health literacy produce billions of dollars in unnecessary costs through prescription drug misuse; unnecessary hospitalization; litigation; illness; and death. Research suggests there is a need to identify patients with health literacy needs and respond to these needs throughout their healthcare process (Safeer & Keenan, 2005; Baker, 2006).

Healthcare providers face the challenge of identifying the needs of their patients and responding accordingly. This challenge becomes especially troubling when a providers' accuracy in identifying individuals with low literacy is only 40% (Lindau et al., 2002). Subsequently, providers are left in need of a quick and efficient means of identifying patients with inadequate health literacy skills. Knowledge of a patient's health literacy level, much like other patient data, will allow providers to adjust their healthcare interactions to more effectively meet the needs of their patients, thereby improving the quality of patient-provider interaction, promoting adherence and thus resulting in better health outcomes. In response to this clinical need, this study offers clinicians and educators an efficient health literacy screening tool; provides knowledge of socio-demographic variables associated with health literacy; and identifies the population's awareness of health literacy and readiness for patient health education. The following sections provide a discussion of these findings.

Study Findings

This sample is representative of the current veteran population receiving Veteran Health System services in North Florida. This sample consists primarily of older, white males. More than 50% of participants report having high blood pressure; more than one third have diabetes; and 10% report having had a stroke in their lifetime. Based on results of the three screening tools, 7% to 20% of respondents had inadequate health literacy skills; 8% to 37% had marginal health literacy skills; and 43% to 83% had adequate health literacy skills. As stated previously, the refusal rate for this study was 10%. Though this percentage is not unusually high, one might speculate that individuals who know they cannot read would not want to participate in a literacy study. Thus individuals with inadequate health literacy skills may have avoided participation. Further, if such is the case, the percentage of individuals with inadequate health literacy skills may be under-represented by study findings.

Estimates of inadequate health literacy for the BRIEF (20.1%) were higher than those of the REALM (6.6%) or STOFHLA (9.0%). It should be noted the BRIEF estimates are more representative of previous findings of larger studies suggesting 33% of individuals have inadequate health literacy skills (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993; Partnership for Clear Health Communication, n.d.; Institute of Medicine, 2004). Due to the variance in measurement among the three screening tools (REALM; STOFHLA; BRIEF), it cannot be determined if the differences in measurement result from error in the validated measures (REALM & STOFHLA) or the proposed screening tool (BRIEF). However, previous research supports the findings of the BRIEF screening tool and thus, further supports the validity of the BRIEF in the clinical ambulatory setting (Chew et al., 2004; Wallace et al., 2006).

The discrepancy in results from the three assessments (BRIEF, REALM, & STOFHLA) is likely a function of the slight differences in the scope of each tools' measurement of the

construct of health literacy. However, it should be noted the findings of this study suggest the BRIEF measures one distinct construct, “health literacy.” Despite discrepancies between the three screening measures, study findings provide evidence supporting the assertion that all three of the health literacy screening tools are positively correlated; and the BRIEF screening tool will accurately identify participants with inadequate and marginal health literacy skills. Findings also suggest the addition of the fourth item, “How often do you have a problem understanding what is told to you about your medical condition?” increased the internal validity of the BRIEF screening measure. The results of the ROC (receiver operating characteristic) analysis provide further evidence that the BRIEF is more sensitive when detecting inadequate and marginal health literacy when compared to the single items.

However, data indicate that though the BRIEF is sensitive, it is not always accurate due to false positives. This finding suggests the BRIEF will identify individuals as having inadequate health literacy when they in fact have adequate health literacy skills. Findings also indicate the BRIEF items identify individuals with inadequate health literacy skills with more accuracy than individuals with marginal health literacy skills. Despite these minor issues, the BRIEF tool will assist providers in identifying individuals with health literacy needs in the clinical setting. The BRIEF will allow clinicians and educators to be sensitive to patients’ needs; if it is discovered no assistance with health literacy is needed, then it is simply not provided. In this case it is better to be safe than sorry.

Further, it should be noted the BRIEF tool only requires one to two minutes to administer while the administration times for the other tools are between four (REALM) and seven (STOFHLA) minutes. This time may seem insignificant when considering one assessment. However clinicians commonly see many patients a day, thus precious time can be spared using

the BRIEF screening measure. For example, if the average patient visit is 20 minutes and a clinician has twenty visits a day, if the physician administers the BRIEF it will take away less than two minutes from each patient visit, about 20 to 30 minutes to screen all visiting patients from the daily schedule; versus approximately 60 minutes (REALM) or 140 minutes (STOFHLA) respectively for the other two instruments. The loss of approximately one to two patient interactions per day is made acceptable through greater satisfaction and better patient outcomes. Further, once patients have been screened, re-evaluation is only necessary every five to ten years, or after traumatic events (i.e., head injury).

Chew and colleagues (2004) recommended three items [How often do you have someone help you read hospital materials; How confident are you filling out medical forms by yourself; How often do you have problems learning about your medical condition because of difficulty understanding written information?] and suggested using a five point Likert scale, using the response “sometimes” as the cut-off for inadequate health literacy. Thus, a response of “sometimes” on any of the three items, which would be scored as a ‘3’, indicated inadequate/marginal health literacy. As with Wallace and colleagues (2006), who suggested using the item, “How confident are you filling out medical forms by yourself?” who also recommended a five-point Likert response scale, using the response “sometimes,” as the cut-off for inadequate/marginal health literacy skills. Likewise, the findings of this study recommend the following scale for interpretation. A BRIEF score of: 4-12 = inadequate; 13-16 = marginal; and 17-20 = adequate health literacy skills.

Findings from this study should be interpreted with caution. Further research is needed to validate the efficacy of the BRIEF health literacy screening tool to determine the rate of inadequate health literacy in the general population and among priority sub-populations. Further,

though the three measures used in this study represent varying aspects of the concept of health literacy, contributing to error in measurement, the REALM and STOFHLA are currently the most studied and validated health literacy screening measures available. Thus, researchers and practitioners are faced with the challenge to continue efforts in measuring health literacy in diverse populations. These efforts remain imperative as researchers seek to understand the interpersonal and cultural contexts of communication in medical encounters (Street, 2003).

In addition to the use of the BRIEF health literacy screening as a means for identifying individuals with inadequate health literacy, findings of the step-wise multiple regression analysis suggested there were several statistically significant explanatory variables which could help predict an individual's health literacy skills. Perceived reading ability; age; educational level; ethnicity; perceived ability to define health literacy; and having diabetes were jointly associated with 34% of the STOFHLA score variance.

One's perception of his/her ability to read was the greatest predictor of health literacy skills. These findings provide implications for the role of self-efficacy in determining one's ability to read and understand health information. As with many other behaviors requiring skill, an individual's self-efficacy is a significant predictor in determining if the individual can demonstrate that particular skill. Therefore, in addition to providing patients with skills, educators and clinicians should provide verbal support and empower patients to promote self confidence, thus increasing one's sense of self-efficacy contributing to the acquisition and successful utilization of health literacy skills without embarrassment or shame.

Further, people who report they have the ability to define health literacy are more likely to have higher health literacy skills. This association is logical but likely involves a moderating variable such as self-efficacy; awareness; or educational level. Further research is needed to

decipher if the relationship is direct or moderated by another variable. However, findings provide implications for allocating resources for large scale health literacy public communication campaigns to increase awareness and open communication channels with the general public. Communication campaigns can increase the awareness of the general population and promote the likelihood of individuals becoming aware of the topic of health literacy the associated outcomes and thus seek knowledge and support when interacting with health information and the healthcare environment.

Being older, less educated, and being a minority are variables related to lower levels of health literacy; these findings replicate previously published findings (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993; Sudore et al., 2006). Though the Department of Health and Human Services (2000) suggest anyone is likely to need assistance with health information, current literature and the findings of this study suggest there are demographic variables associated with and thus predictive of an individuals' health literacy level. Though all patients should receive screening and assistance with health information, health educators and clinicians should be alert to priority populations that are adversely affected by inadequate health literacy such as patients who are poor, elderly, uneducated, and/or a minority.

Finally, in this sample of participants, having diabetes is predictive of having lower health literacy scores. Whether having inadequate health literacy skills was a contributing variable in the outcome of diabetes, cannot be determined. What is relevant is the role of inadequate health literacy in the management of a condition such as diabetes. Previous research has identified associations between management of diabetes and health literacy level (Schillinger et al., 2002; Kutner, Greenberg & Baer, 2006). These findings provide implications for clinical practice. If participants with diabetes are likely to have lower health literacy scores, providers need to be

aware of this risk factor and respond through clinical intervention. Further, these patients may have difficulty managing their diabetic condition, therefore requiring individualized modifications to their management regimen. Patient education may provide an option for monitoring their condition and providing them with the necessary information and disease management training.

Though anyone is likely to need assistance with health information regardless of demographic status (U.S. Department of Health and Human Services, 2000), certain populations are at increased need and offer support to previous research which suggests being elderly (Schneider, 2006; Kirsch et al., 1993), a minority (Kirsch et al., 1993; Cooper, & Roter, 2003; Sudore et al., 2006b), and having less education (Lukoschek, Fazzari, & Marantz, 2003; Howard, Sentell, Gazmararian, 2006, p. 857) is associated with low and marginal health literacy skills. Study results imply immediate need for increasing health literacy assistance to these groups. For many reasons, initially identifying these groups for assistance with healthcare information can begin to lessen existing health disparities among the general population. The findings of this study also contribute supportive evidence for the association between socio-demographical variables and health literacy skills, contributing knowledge to support the influence of the cultural context within the framework of the ecological model of medical encounters (Street, 2003).

Based on the findings of this study it is recommended that health educators and clinicians utilize the findings to: (1) equip themselves' with an efficient, inexpensive screening tool to identify inadequate health literacy; (2) identify demographical characteristics that may put individuals at risk for having inadequate health literacy skills; and (3) address health literacy when exchanging health information with patients.

In making the connection between screening patients' health literacy skills and intervening with individuals' with inadequate health literacy, this study attempted to identify the sample population's level of awareness and readiness to engage in health literacy related initiatives set forth by educators, clinicians, and the veteran healthcare system in general. The findings of this study indicate the majority of participants were knowledgeable about health literacy; confident in their ability to seek support; and had received support related to health information. The majority of participants reported they were able to define "health literacy." However, they were not required to define the concept. This limitation should be amended in future research; it is recommended that future studies ask participants to define "health literacy" in an effort to distinguish between perception of one's ability to define the concept and their actual ability. Further, more than 30% of respondents were neutral or strongly disagreed about their ability to define "health literacy." Based on the results of these survey items, there is an identified need to continue efforts in raising awareness and educating patients about the concept of health literacy and the associated outcomes (increased risk of hospitalization; increased cost of healthcare; etc.).

Unfortunately, 16% of respondents reported not receiving support with health information; 12% did not report intention to seek support related to health information in the future; and similarly, 13% did not report feeling confident in their ability to seek support related to health literacy. These findings suggest that among this small portion of the population, information related to health literacy is needed to enhance the level of knowledge possessed by consumers of the VA health system. The higher the percentage of patients who know what health literacy is; are aware of their need for assistance; and are confident enough to seek assistance, the better the expected health outcomes for the general patient population. A health communication campaign highlighting the concept of health literacy; identifying associated outcomes and interventions to

prevent adverse outcomes may be an effective way to inform and educate the entire population. Increased awareness cannot amend the issue of health literacy. However increased awareness can mobilize the target population into a stage of contemplation and promote moving them into the action phase of obtaining information about health literacy and the help they need to understand and use health information.

The majority of participants reported awareness of available health education resources. However, participants were not required to list the resources; therefore there is no way to determine which resources they were aware of, nor how many they could identify. Future research should collect this data to better understand specific issues associated with awareness and access to health education resources. More than 20% of this sample reported being unaware of available patient health education resources. Based on these findings it is suggested further efforts are needed to inform the population of the current availability of resources within the VA health system. Because 18% of participants reported they had not received health education resources in their lifetime; it may be possible the sample population is not aware when they are receiving patient education or are unaware of services they are entitled to receive. If so, this provides implications for patient health education practices within the VA. One way to address this issue is to label and specifically identify patient education materials as such.

Fourteen % of the sample did not report intention to seek patient health education resources in the future. This may be related to the 10% of participants who did not report feeling confident in their ability to seek health education support. Either way, there is a significant portion of the population who is unaware of resources; has not received health education resources; does not intend to seek health education resources; and does not report having the confidence to seek educational resources. These findings provide a clear indication for the need

to raise the populations' awareness of available resources, and provide access and support for individuals who may need health education but may not be prepared to ask for help. This is a common challenge for clinicians and practitioners. However providing information and shame-free assistance can promote the likelihood of moving patients from pre-contemplation and contemplation into the action phase of obtaining health education resources and participating in their healthcare and adhering to the healthcare regimen.

Through the combined efforts of researchers, educators, clinicians, and administrators, with institutional support and resources, patients can more effectively share in the responsibility for their healthcare. Patients who have the skills to actively participate in their healthcare process can more effectively function as a reliable knowledgeable resource, who can exchange and comprehend health information and make functional medical and personal health decisions to assume ownership of their healthcare process and produce better fiscal and health related outcomes. When patients assume this role the professional members of the healthcare team also benefit, because (1) the patient is assuming responsibility for himself as an influencing factor in their health outcomes; and (2) health literate, functional patients are more likely to adhere to healthcare regimens and manage health conditions resulting in reduced use of healthcare services, which in turn helps to preserve the vitality of healthcare providers. In closing, screening patients for inadequate health literacy; informing them about health literacy and the associated outcomes; and providing health education and information resources is a win-win for patients, clinicians and the larger healthcare system. In the case of health literacy clearly, as the adage states, an ounce of prevention is worth a pound of cure.

Limitations

Study limitations should be noted when interpreting results. Patient participants were recruited from the North Florida region and therefore results cannot be generalized to other

populations or geographical regions of the United States. Further, because the sample was not randomized, potentially confounding variables may have introduced error into measurement that is not accounted for in the analysis. Thus, inferences should be made with caution. Further the homogeneous nature of this small sample may have influenced findings. Self-reports on the BRIEF and the participant survey also pose a limitation to inferences made from study findings.

Recommendations

It is incumbent upon the medical community to acknowledge the issue of health literacy as a national health priority. Researchers have the responsibility to continue the development of screening tools and strategies to ensure that patients receive assistance in overcoming barriers that limit their ability to function adequately in the healthcare environment. Specialists in health literacy suggest that past efforts have been effective in advancing the field of study toward the goals of the Institute of Medicine; however, persistent efforts for the next several decades are imperative for continued progress (Parker & Kindig, 2006). Saha (2006) suggests enhanced health literacy levels are a fundamental component of reducing health disparities among minorities and individuals with low socioeconomic status. Incremental and systemic change is necessary to improve the health literacy of the general public, particularly priority populations (Chew, Bradley, Boyko, 2004). Additionally, researchers, educators and providers need to find innovative ways to identify individuals with inadequate levels of health literacy and intervene to protect the integrity of their healthcare process. While policy makers and administrators need to allocate funds and support programs that can serve as resources for patient health educators, healthcare providers, and patients. There are several ways health educators, healthcare providers, and other health professionals can collaborate to increase the quality of healthcare experience and outcomes for individuals with low health literacy. Recommendations and implications for the roles of educators; health professionals; and future research needs follow.

Implications for the Role of Health Educators and Health Education

Findings provide important implications for professionals in patient and health education. The results of this study indicate that a significant percentage of the patient population needs support related to health literacy, due to inadequate or marginal health literacy skills. Health educators have a critical role in identifying individuals with low health literacy and providing remediation to individuals who need assistance with health information. Health educators are in a unique position to respond to the social issue of health literacy and have the expertise and the resources to provide programmatic support to individuals with low health literacy. Patient health educators in the clinical setting can implement the BRIEF screening tool with patients as standard procedure to provide themselves and the healthcare team information about patients' ability to understand health information. Health educators can use their knowledge of the patient's health literacy level to individualize strategies for providing patient education instruction. This will allow patient educators to align their instructional process to more effectively meet the needs of patients. In addition, health educators can act as advocates for patient empowerment and patient-centered healthcare. Health educators can use their position as health role models to influence people to take an active role in the management of their healthcare.

Health educators can maintain a personal health literacy initiative through the development of their own health information materials and programs. Health educators can utilize instrumental and programmatic interventions to quickly and easily identify individuals with inadequate health literacy and then provide them with effective strategies to increase their health literacy skills. Patient education interventions should be implemented with grade-level appropriate patient education materials directed toward priority populations. Health educators and other developers of health related materials can benefit from aligning the reading level of

their educational materials with the typical reading level of their intended audience. For health educators, it is a professional responsibility to equip individuals with the tools necessary to proficiently navigate through health related situations, and to empower individuals to seek assistance when needed without feeling shame (Parikh et al., 1996; Baker et al., 1996).

Further, school based health educators should integrate health literacy components into the curriculum to prepare individuals to be informed proactive participants in the healthcare process in compliance with the National Standards for School Health Education (Joint Committee on National Health Education Standards, 1995). Providing individuals with preliminary health literacy skills by integrating health literacy into the educational curriculum increases the likelihood of instilling health literacy skills over time. Providing people with health literacy skills early in life prevents the negative affects of inadequate health literacy skills later in life.

Undoubtedly, these recommendations will require resources and efforts to identify and respond to patients' health literacy needs. Costs, particularly in time and effort are unavoidable, and are far outweighed by the cost of outcomes associated with inadequate health literacy. Progress in responding to individuals' health literacy needs is critical to minimizing the associated adverse health outcomes, unnecessary healthcare costs and litigation that drain healthcare resources and prevent healing and wellness in the patient population.

Implications for the Role of Providers and other Healthcare Professionals

Though advances have been made in health literacy research over the past ten years, “greater attention to health literacy is still needed in medical education. . .to foster clear patient communication” (Kripalani & Weiss, 2006, p. 890). In becoming more aware of patients' health literacy needs, healthcare professionals can take many steps in encouraging patient participation and understanding. First, practitioners should commonly offer patients assistance to normalize the process of seeking and receiving help in the healthcare environment. Second, Kripalani and

colleagues (2006) recommend seven vital steps to improving the quality of clinical encounters between patients and their providers; the first of which is to assess patients' baseline understanding before providing health information. This can be done quickly with the BRIEF instrument proposed in this study. The REALM and STOFHLA are also viable options for identifying patients' health literacy needs, but are more complex to administer and take more time. Third, practitioners can increase adherence and patient cooperation by appropriately providing necessary assistance and intervention for any deficiency in health literacy skills. Fourth, providers should assist patients when completing forms and ensure that written materials are aligned with the patients' reading level (Doak et al., 1996). Fifth, individuals with low levels of health literacy skills should receive information in non-written formats, such as: visuals, audiotapes, and/or videotapes (Parker, 2000; Potter & Martin, 2003). Individualized support for the specific needs of the patient will increase the probability of positive health outcomes and satisfaction with the healthcare experience.

Practitioners can utilize many simple techniques to increase patient understanding and promote a shame-free environment. Methods include tailoring medical regimens to an individual's daily routine, verifying that patients understand, and tailoring teaching methods to individual needs, such as asking the patient to restate information or instructions (Potter & Martin, 2003). Additionally the use of common words, avoiding technical language; talking slowly; listening carefully; and only providing necessary information will assist all patients, not just those with low literacy (Potter & Martin, 2003). Providing supportive statements, such as "This form is very complicated and difficult for a lot of people" can also promote a shame-free empowering supportive environment (Potter & Martin, 2003). Additionally, health professionals should familiarize themselves with formal literacy assessments and their scales, so when records

are available they can correctly interpret and use the information to individualize assistance and benefit the client or patient. Institutionalization of health literacy related education programs can be achieved through health literacy policies developed to ensure healthcare settings will have the resources to provide remediation or representation for individuals with low health literacy. These measures will support individuals' health literacy needs and promote the likelihood of a successful healthcare encounter.

Ultimately, healthcare providers and administrators will have to find innovative ways to respond to the needs of patient's with inadequate health literacy skills. This commitment to providing an individualized approach to healthcare will promote patient trust; increased comprehension; compliance; better health outcomes; and more satisfaction for patients when receiving healthcare. As long as one in three individuals have inadequate health literacy skills, the financial drain and adverse health related outcomes will be a burden on patients, providers and the healthcare system. To advance the health of the general population and reduce disparities as proposed by the objectives of *Healthy People 2010*, educators, administrators, and clinicians alike will have to respond the health literacy needs of individuals and create a long-term alliance against the dilemma of inadequate health literacy (U.S. Department of Health and Human Services, 2000).

Putting Research into Practice through Policy and Systemic Change

Based on the findings of this study, an evaluation study is being proposed in the participating VA organization to support a policy to administer the BRIEF to each patient and place the patient's health literacy level in the computerized patient record. To better serve patients, it is recommended that the VA health system, and all other patient care facilities, screen patients' health literacy level; post their literacy level in their computerized patient record; and modify the healthcare process to meet the individual needs of the patient (See Appendix F).

Additional research is needed to standardize the screening process to assure accuracy. Further, if the screening process is implemented to provide health literacy postings in patients' permanent records, there may be an issue with accountability in responding to patients' documented needs. The legal implications of identifying and responding to individuals' needs based on the BRIEF tool posting needs to be addressed as a part of implementing the screening and posting process. Therefore, any plan to identify and post patients' health literacy level should have a response system developed and implemented in tandem to assure the needs of patients' are not only identified but also responded to in an efficient and comprehensive manner. Systemic change based on empirical research and practice will promote effective health care practices and promote high quality health care outcomes.

The adverse outcomes associated with inadequate health literacy affect the general population. The findings of this study can be translated and disseminated to non-VHA healthcare facilities. Further, whether a healthcare facility employs an electronic patient record system or a traditional paper-based system, clinicians can screen patients; post their health literacy level in the patient record; and respond with individualized patient care. Screening patients within and outside of the veteran healthcare system can provide data to identify the national prevalence of inadequate health literacy, while simultaneously allowing clinicians to respond to patient needs.

Recommendations for Future Research

The following recommendations provide directions for future research efforts in the area of health literacy and patient health education.

1. Future research efforts should continue to establish the validity the BRIEF screening tool for identifying individuals with inadequate and marginal health literacy skills.

2. Future research should continue to investigate, and provide knowledge pertaining to the influencing factors related to the interpersonal and cultural contexts of the medical encounter between patients and providers.
3. Expand the scope of current research through the use of a larger more diverse population, including females and non-veteran patient populations. A national data collection effort would provide critical information for gathering data to guide future research efforts.
4. Continue research on the association between socio-demographic variables and health literacy level. Further continued efforts in identifying and monitoring variables associated with health literacy will provide indications of population need and identify disparities in the healthcare system. These data and continued research in this area contribute to evaluating progress toward the goals of Healthy People 2010 (U.S. Department of Health and Human Services, 2000).
5. Explore the influence of one's health literacy level in medical encounters occurring between patients and their healthcare providers.
6. Further investigate perceived reading ability (self-efficacy) as it relates to health literacy skills.
7. Utilize qualitative research methods to investigate the construct of health literacy for both patients and their healthcare providers in diverse healthcare settings.
8. Develop training protocols for providers to increase their awareness of the role of health literacy in the healthcare environment and increase the ability of providers to intervene.
9. Develop patient education workshops for patients to increase awareness of the role of health and increase individual health literacy skills.

10. Evaluate and identify the long-term political and financial implications of not responding to patients' health literacy needs in the healthcare setting.

Conclusion

The complex dynamics of health literacy will require a complex and multifaceted solution. Regardless, a significant portion of the population possesses inadequate health literacy skills and is unprepared to effectively engage in the healthcare process. The impact this problem has on society suggests the need for remedial efforts; otherwise patients and providers are at risk for experiencing less than optimal healthcare outcomes. Due to the high number of people who are affected by inadequate health literacy and the costs related to the associated outcomes of inadequate health literacy, this problem is a national dilemma, and thus should be a societal priority (Committee on Health Literacy, 2004; U.S. Department of Health and Human Services, 2000).

For individuals to experience optimal healthcare and health-related outcomes they must obtain proficient health literacy skills and/or attain assistance (Committee on Health Literacy, 2004). Before assistance can be provided it is necessary to identify the individual's need of assistance, if any. This requires an efficient screening process that can provide an indication of an individual's health literacy level. The findings of this study suggest the health literacy screening process can be done quickly and efficiently (less than two minutes) with the four item BRIEF assessment.

As health educators and clinicians develop a comprehensive approach toward addressing inadequate health literacy, the BRIEF health literacy screening tool should be recognized as a quick, low- to no-cost means for quickly screening patients. Educators and clinicians also need to adopt a shame-free empowering approach when addressing health literacy with patients (Parikh

et al., 1996; Baker et al., 1996). Empowering patients will remove any stigma associated with low literacy and will provide patients with the support they need to empower themselves to participate in their healthcare. Assessing patients' health literacy needs and responding with individualized education and care that are aligned with their personal needs will produce increased patient adherence; reduce litigation; promote better health outcomes; and preserve precious healthcare resources. The millions of individuals in the United States who lack adequate health literacy skills and the billions of dollars spent annually resulting from low health literacy and associated adverse outcomes, warrant a national initiative aimed at reducing the number of individuals adversely affected by inadequate levels of health literacy.

APPENDIX A
PARTICIPANT SURVEY

ID #: _____

DATE: _____

PARTICIPANT SURVEY

Thank you for taking the time to complete this survey. The purpose of this survey is to learn about you. The information you give is very important. Please mark the appropriate response to the following questions.

1. Please indicate your gender.

- ① Male
- ② Female

2. What is your current age? _____

3. What is your highest completed level of education?

- ① Elementary School (Grades 1st – 5th)
- ② Junior High School (Grades 6th – 8th)
- ③ Some High School (Grades 9th – 12th)
- ④ High school/GED
- ⑤ Some College
- ⑥ College Degree

4. Please indicate the race/ethnicity that best describes you.

- ① African American/Black
- ② Asian American
- ③ Caucasian/White
- ④ Hispanic/Latino
- ⑤ Hawaiian, Pacific Islander
- ⑥ Native American, Alaskan Native
- ⑦ Other _____

5. Is English your native language?

- ① Yes
- ② No

6. Do you rent or own your place of residence?

- ① Rent
- ② Own

7. What is your current work status?

- ① Work full-time
- ② Work part-time
- ③ Not working
- ④ Disabled
- ⑤ Retired

8. How do you rate your reading ability?

- ① Excellent
- ② Very good
- ③ Good
- ④ Fair
- ⑤ Poor

9. Do you have high blood pressure?

- ① Yes
- ② No
- ③ I don't know

10. Have you ever had a stroke?

- ① Yes
- ② No
- ③ I don't know

11. Do you have diabetes?

- ① Yes
- ② No
- ③ I don't know

Please indicate your level of agreement or disagreement with the following items.

12. I can define "health literacy."

- ① I strongly agree
- ② I agree
- ③ I am neutral
- ④ I disagree
- ⑤ I strongly disagree

13. I am aware of patient health education resources that are available to me.

- ① I strongly agree
- ② I agree
- ③ I am neutral
- ④ I disagree
- ⑤ I strongly disagree

14. I am confident in my ability to seek support concerning health literacy.

- ① I strongly agree
- ② I agree
- ③ I am neutral
- ④ I disagree
- ⑤ I strongly disagree

15. I am confident in my ability to seek patient health education to assist me with health information.

- ① I strongly agree
- ② I agree
- ③ I am neutral
- ④ I disagree
- ⑤ I strongly disagree

16. During my lifetime, I have received support concerning health information.

- ① I strongly agree
- ② I agree
- ③ I am neutral
- ④ I disagree
- ⑤ I strongly disagree

17. In the future, I intend to seek support related to health information.

- ① I strongly agree
- ② I agree
- ③ I am neutral
- ④ I disagree
- ⑤ I strongly disagree

18. During my lifetime, I have received patient health education resources.

- ① I strongly agree
- ② I agree
- ③ I am neutral
- ④ I disagree
- ⑤ I strongly disagree

19. In the future, I intend to seek patient health education resources.

- ① I strongly agree
- ② I agree
- ③ I am neutral
- ④ I disagree
- ⑤ I strongly disagree

APPENDIX B
TEST OF FUNCTIONAL HEALTH LITERACY IN ADULTS: SHORT FORM

ID #: _____
DATE: _____

**The Test of Functional Health Literacy in Adults: Short Form
STOFHLA**

PASSAGE A

Your doctor sent you to have a _____ X-ray.

- a. stomach
- b. diabetes
- c. stitches
- d. germs

You must have an _____ stomach when you come for _____.

- | | |
|-----------|-------|
| a. asthma | a. is |
| b. empty | b. am |
| c. incest | c. if |
| d. anemia | d. it |

The X-ray will _____ from 1 to 3 _____ to do.

- | | |
|---------|-----------|
| a. take | a. beds |
| b. view | b. brains |
| c. talk | c. hours |
| d. look | d. diets |

THE DAY BEFORE THE X-RAY

For supper have only a _____ snack of fruit, _____ and jelly, with coffee or tea.

- | | |
|-----------|-----------|
| a. Little | a. toes |
| b. Broth | b. throat |
| c. Attack | c. toast |
| d. snack | d. thigh |

After _____, you must not _____ or drink

- | | |
|-------------|----------|
| a. minute | a. easy |
| b. midnight | b. ate |
| c. during | c. drank |
| d. before | d. eat |

anything at _____ until after you have _____ the X-ray.

- | | |
|---------|--------|
| a. ill | a. are |
| b. all | b. has |
| c. each | c. had |
| d. any | d. was |

THE DAY OF THE X-RAY

Do not eat _____.

- a. appointment
- b. walk-in
- c. breakfast
- d. clinic

Do not _____, even _____.

- | | |
|----------|-----------|
| a. drive | a. heart |
| b. drink | b. breath |
| c. dress | c. water |
| d. dose | d. cancer |

If you have any _____, call the X-ray _____ at 616-4500.

- | | |
|--------------|---------------|
| a. answers | a. Department |
| b. exercises | b. Sprain |
| c. tracts | c. Pharmacy |
| d. questions | d. Toothache |

PASSAGE B

I agree to give correct information to _____ if I can receive Medicaid.

- a. hair
- b. salt
- c. see
- d. ache

I _____ to provide the county information to _____ any

- | | |
|----------|--------------|
| a. agree | a. hide |
| b. probe | b. risk |
| c. send | c. discharge |
| d. gain | d. prove |

statements given in this _____ and hereby give permission to

- a. emphysema
- b. application
- c. gallbladder
- d. relationship

the _____ to get such proof. I _____ that for

- | | |
|-----------------|----------------|
| a. inflammation | a. investigate |
| b. religion | b. entertain |
| c. iron | c. understand |
| d. county | d. establish |

Medicaid I must report any _____ in my circumstances

- a. changes
- b. hormones
- c. antacids
- d. charges

within _____ (10) days of becoming _____ of the change.

- | | |
|----------|----------|
| a. Three | a. award |
| b. One | b. aware |
| c. Five | c. away |
| d. Ten | d. await |

I understand _____ if I DO NOT like the _____ made on my

- | | |
|---------|---------------|
| a. thus | a. marital |
| b. this | b. occupation |
| c. that | c. adult |
| d. than | d. decision |

case, I have the _____ to a fair hearing, I can _____ a

- | | |
|-----------|------------|
| a. Bright | a. request |
| b. Left | b. refuse |
| c. Wrong | c. fail |
| d. Right | d. mend |

hearing by writing or _____ the county where I applied.

- a. counting
- b. reading
- c. calling
- d. smelling

If you _____ TANF for any family _____, you will have to

- | | |
|----------|-------------|
| a. wash | a. member |
| b. want | b. history |
| c. cover | c. weight |
| d. tape | d. seatbelt |

_____ a different application form. _____, we will use

- | | |
|-----------|------------|
| a. relax | a. Since |
| b. break | b. Whether |
| c. inhale | c. However |
| d. sign | d. Because |

the _____ on this form to determine your _____.

- a. lung
- b. date
- c. meal
- d. pelvic

- a. hypoglycemia
- b. eligibility
- c. osteoporosis
- d. schizophrenia

APPENDIX C
RAPID ESTIMATE OF ADULT LITERACY IN MEDICINE

ID #: _____
DATE: _____

Rapid Estimate of Adult Literacy in Medicine (REALM)

	List 1	List 2	List 3
	Fat	Fatigue	Allergic
	Flu	Pelvic	Menstrual
	Pill	Jaundice	Testicle
	Dose	Infection	Colitis
	Eye	Exercise	Emergency
	Stress	Behavior	Medication
	Smear	Prescription	Occupation
	Nerves	Notify	Sexually
	Germs	Gallbladder	Alcoholism
	Meals	Calories	Irritation
	Disease	Depression	Constipation
	Cancer	Miscarriage	Gonorrhea
	Caffeine	Pregnancy	Inflammatory
	Attack	Arthritis	Diabetes
	Kidney	Nutrition	Hepatitis
	Hormones	Menopause	Antibiotics
	Herpes	Appendix	Diagnosis
	Seizure	Abnormal	Potassium
	Bowel	Syphilis	Anemia
	Asthma	Hemorrhoids	Obesity
	Rectal	Nausea	Osteoporosis
	Incest	Directed	Impetigo

SCORE List 1 _____ List 2 _____ List 3 _____ Raw Score _____

APPENDIX D
BRIEF HEALTH LITERACY SCREENING TOOL

ID #: _____

DATE: _____

BRIEF: Health Literacy Screening Tool

Please circle the answer that best represents your response.

1. How often do you have someone help you read hospital materials?
 - a. Always
 - b. Often
 - c. Sometimes
 - d. Occasionally
 - e. Never

2. How confident are you filling out medical forms by yourself?
 - a. Not at all
 - b. A little bit
 - c. Somewhat
 - d. Quite a bit
 - e. Extremely

3. How often do you have a problems learning about your medical condition because of difficulty understanding written information?
 - a. Always
 - b. Often
 - c. Sometimes
 - d. Occasionally
 - e. Never

4. How often do you have a problem understanding what is told to you about your medical condition?
 - a. Always
 - b. Often
 - c. Sometimes
 - d. Occasionally
 - e. Never

Health Literacy Research: The validation of a short-form health literacy screening assessment

A critical element to increasing the quality of patient healthcare is to practice **patient-centered care** with a **health literacy initiative**. It is also critical that clinicians create an **empowering supportive environment** that relies on **informal health literacy assessments** that are **brief, easy to implement** and **practical** to assist in facilitating **appropriate care** and **decision making** that **meet the patient's needs**.

We would like to invite you to partner in our efforts in health literacy research here at the VA.

- *Clinicians are invited to recruit VA patients to participate in a brief assessment
- *Participation for VA participants will take approximately 20 minutes or less
- *Clinicians are asked to introduce the project and provide potential participants with investigator contact information

Clinicians with interest are invited to assist in data collection

Data collectors are required to participate in a thirty-minute in-service training; sessions will be scheduled for groups or individual training is available upon request.

For further information contact:
Patty Donaldson: 376-1611 ext. 7005 or pager 2022
Jolie Haun: 904-377-6796

UF-IRB approved (629-2005)

APPENDIX F
MEMORANDUM: PROPOSED HEALTH LITERACY SCREENING POSTING

Department of Veterans Affairs
North Florida/South Georgia Veterans Health System

MEMORANDUM NO:

January 10, 2007

PATIENT HEALTH LITERACY POSTING IN THE COMPUTERIZED RECORD SYSTEM

1. PURPOSE. To establish policy and procedure for patients and/or families to receive education specific to their health literacy abilities. Providers can identify patients' health literacy needs using a 4-item brief health literacy screening tool and respond with tailored care, support, and education referrals.
2. POLICY. Information vital to patient is entered into electronic progress notes as a means of documentation and communication. A 4-item brief health literacy screening tool provides a clinically valid screening tool for assessing health literacy. Posting the results of patients who scores reflect health literacy issues alert healthcare team members patient needs assistance with written/spoken medical information.
3. DEFINITIONS.
 - a. Low Health Literacy. The inability to read, understand, and use health care materials. Low health literacy can affect anyone of any age, ethnicity, background, or educational level. The consequence of poor health literacy and the associated lack of understanding of written or oral health communications can lead to safety issues, medication errors, inaccurate or incomplete health histories, and adverse medical outcomes.
 - b. Clinical warning. These notes are entered to communicate information related to issues of patient safety and are intended to serve as a warning or alert to staff.
 - c. CWADH. This will appear on the cover sheet of the patient electronic record if an entry has been made in any of the various patient-posting categories: C=Crisis Note, W=Clinical Warning, A=Allergy, D=Advance Directives and H=Health Literacy Issue.
 - d. Health Record (HR). The HR is a comprehensive reflection of the treatment modalities utilized by the professional and administrative specialties throughout the patient's periods of health care. The HR may be maintained as a paper record component or a computer-based record component (an electronic record stored in the Computerized Patient Record System [CPRS] or other automated system which provides easy retrievability of complete, accurate, and timely medical information.
 - e. Medical Record. The portion of the HR that officially documents the diagnosis, treatment, and/or care of a patient.
 - f. Clinical Reminder. A clinical reminder is a notation to remind clinicians of an action that is generally required for an individual patient, or patients in particular groups. Clinical reminders are dynamic; i.e., they are a function of CPRS, not stored data elements. Clinical reminder behavior

changes with time; e.g., some reminders apply only to certain age ranges, which is clearly a function of time. Clinical reminders are also influenced by what diagnosis(es) a patient carries, which can change, etc.

(1) Clinical Reminders are a clinical decision support tool to assist health care staff; they are not a part of the clinical record. The reminders are recommendations, based on clinical and administrative policy, and are always to be interpreted in the context of the practitioner's knowledge of the patient. When a clinical reminder is triggered inappropriately due to an improper code selection, facility policy determines how a correction will be done.

4. PROCEDURES.

a. Patients will be screened for health literacy abilities using the health literacy clinical reminder. The reminder consists of the following four questions.

1. How often do you have someone help you read hospital materials?

1. Always
2. Often
3. Sometimes
4. Occasionally
5. Never

2. How confident are you filling out medical forms by yourself?

1. Not at all
2. A little bit
3. Somewhat
4. Quite a bit
5. Extremely

3. How often do you have a problems learning about your medical condition because of difficulty understanding written information?

1. Always
2. Often
3. Sometimes
4. Occasionally
5. Never

4. How often do you have a problem understanding what is told to you about your medical condition?

1. Always
2. Often
3. Sometimes
4. Occasionally
5. Never

Score Interpretation: 4-12 = Inadequate; 13-16 = Marginal; 17-20 = Adequate

b. Providers clinically involved with a patient may enter a clinical warning posting which will initiate a progress note for patients scoring 4-12. Entries made to electronic progress note are titled "Health Literacy Issue Clinical Warning." Note will contain the patients' 4-item brief health literacy questions with assessment score, and the following six basic actions needed to improve communication between healthcare members and patient/family.

1. Slow down- Provide a "patient-centered visit", the provider focuses on addressing the patient's concerns. Sitting rather than standing, listening rather than speaking, and speaking slowly. Encourage patient to ask questions.

2. Use plain, non-medical language
 3. Show or draw pictures
 4. Limit the amount of information provided and repeat it
 5. Use the teach-back or show-me technique
 6. Create a shame-free environment
- c. Clinical warning posting may be entered by patient care team members including registered nurses, pharmacists, physician assistants, ARNPs, physicians, and dentists through the Orders tab of the electronic medical record.
5. RESPONSIBILITY.
 - a. Clinical staff with primary responsibility for patient treatment will update or correct health literacy clinical warnings as needed.
 - b. The primary care physician is responsible for ensuring the accuracy and current status of health literacy warning information.
 - c. The Chief, Health Information Management Section (HIMS) is responsible for changing health literacy issue clinical warning notes to historical information only when requested by the primary care physician.
 6. REFERENCES.
 - a. Haun, J. (2007). Health Literacy: The validation of a short form health literacy screening assessment in an ambulatory care setting. Unpublished doctoral dissertation, University of Florida, Florida.
 - b. Memorandum on Patient Posting In the Computerized Patient Record System.
 - c. CPRS Technical Manual. VA Handbook 1907.1
 - d. Chew LD, et al. (2004). "Brief questions to identify patients with inadequate health literacy." Family Medicine, 36(8): 588-94.
 7. **EXPIRATION DATE. November 1, 2007.**
 8. FOLLOW-UP RESPONSIBILITY. Clinical Information Systems Coordinator (CISC).

Thomas Sutton
Acting Director

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BIOGRAPHICAL SKETCH

Native to Florida, born in West Palm Beach, Jolie Haun has lived along the east coast and north central Florida all her life. She lived in St. Augustine for several years, after moving from south Florida after high school. She eventually moved to Gainesville, Florida, to attend the University of Florida as an undergraduate in psychology; she graduated in 1999 with Highest Honors for her clinical research.

After graduating, Jolie moved to Tallahassee, Florida where she attended Florida State University and received a Master of Science in Counseling and Human Systems and Specialization in Education in 2002. She returned to Gainesville in 2003 and began working at Shands Hospital and attending the University of Florida, as an Alumni Fellow doctoral student in the College of Health and Human Performance.

Jolie received a Ph.D. in health behavior from the University of Florida, in May 2007. Her research interests include health communication and health literacy; patient-provider relationship; complementary and alternative medicine; spirituality; and end-of-life issues. She plans to continue her career in research and development related to the patient-provider relationship; health communication and quality of care issues.