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The Relationship of Health Literacy and Locus of Control to Medication Compliance in Older African Americans.

Karen Andrea Armstrong

THE RELATIONSHIP OF HEALTH LITERACY AND HEALTH LOCUS OF CONTROL TO MEDICATION COMPLIANCE IN OLDER AFRICAN AMERICANS

by

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Under the Direction of Patricia Clark

ABSTRACT

Many older African American adults have inadequate health literacy and are more likely to have chronic illnesses needing medication therapy. African Americans continue to experience significant health disparities in the incidences of cardiovascular disease and diabetes. It was postulated that ethnic disparities in medication compliance are related to a dynamic interplay between low health literacy and health locus of control. Thirty older African Americans taking at least one prescription medication were interviewed. Although the vast majority was well-educated, only 53% displayed adequate health literacy. Most of the participants believed they controlled their health, and over half were noncompliant with their medications. Poor health literacy and health locus of control appeared to influence medication compliance in older African Americans.

INDEX WORDS: Medication compliance, Health literacy, Health locus of control, Functional health literacy, and Noncompliance

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by

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To Arthur and Mable Smith

To Winston, Shenelle and Shane

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Chapter One: Introduction

Noncompliance with medication regimens, or medication nonadherence, is the extent to which medical orders or recommendations are not adhered to as instructed, and/or as defined by the healthcare provider (Vlasnik, Aliotta, & DeLor, 2005). Vlasnik et al. state that medication noncompliance is a complex and dynamic behavioral process. Noncompliance is strongly influenced by the patient, the patient's social support system, the practice of health care providers, and the effectiveness of the healthcare delivery systems. The authors state that noncompliance is a patient-centered term; it shows the extent to which an individual's behavior deviates from medical or health advice. It appears that noncompliance is common among patients, regardless of the kind or the severity of the disease. Medication noncompliance is a pervasive and complex problem and the hidden epidemic in our society today (Vermeire, Hearnshaw, Van Royen, & Denekens, 2001; Peterson & McGhan, 2005; Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005).

The geriatric population is most likely to deviate from medication regimens, and older people are especially susceptible to the phenomenon of medication noncompliance (Gazmararian et al., 2006). This finding is unfortunate because medications are the most common therapeutic interventions for diseases in elders, and noncompliance with medication regimens appears to undermine the therapeutic effects of other medical regimens (Fodor et al., 2005). Research shows that noncompliance in older people is manifested in overuse, under-use, inappropriate

administration and selection, failure to properly refill prescriptions, and inappropriate use of expired hoarded medications (Fodor et al., 2005).

Noncompliance may be a deliberate or an unintentional deviation from therapeutic regimens and medical interventions (Reynolds et al., 2004). Intentional noncompliance implies that patients refuse to comply with the regimen, fail to carry out, or deviate from, specific behaviors after making an informed choice. Unintentional noncompliance often results from poor health literacy- a lack of ability to obtain and understand health information. In some cases, elders simply forget to take their medications because of memory impairments, while others choose not to take the medication.

Despite 30 years of research on the subject of medication compliance, little of the research addresses this topic in a cultural context (Vermiere et al., 2001). In fact, very little research on compliance in medication regimens addresses the topic from an African American perspective. This type of research is needed since minorities, especially older African Americans, continue to experience significant health disparities (Sentell & Halpin, 2006; Meadows, 2000). Despite similarities in age, education, and occupational opportunities, African Americans have a higher incidence of both mortality and morbidity compared to their White counterparts. Older African Americans also have a disproportionately higher incidence of hypertension and lung cancers, and they are twice as likely as older Whites to have diabetes (Safeer & Keenan, 2005; Webster & Perry, 2005; Sarkar, Fisher, & Schillinger, 2006; Powell, Hill, & Clancy, 2007). Although older African American women are 12% less likely to get breast cancer than older White women, their mortality rate from this disease is 16% higher (U.S. Department of Health and Human Services, 2000).

Identifying factors that may influence health literacy and medication noncompliance

among African Americans may lead to a greater understanding of the way African American elders use the health care delivery system, which in turn may help to explain the differences between African Americans and Whites in mortality and morbidity. This study will address the issue of medication compliance among older African Americans. The primary goal of this study is to investigate whether compliance is associated with health literacy and/or locus of control in this population.

The specific aims of the study were: 1) to identify and understand factors that lead to medication noncompliance among older African Americans and 2) to determine if health literacy and locus of control are associated with medication compliance in older African American adults.

Chapter Two: Literature Review

Significance of the Problem

According to Hixon (2004) and Safeer and Keenan (2005), lower levels of health literacy are associated with less knowledge about chronic disease conditions, poorer health status, and increased rates of hospitalization which result in higher healthcare costs. Webster and Perry (2005) state that medication administration in older adults needs more attention because in both private and institutional settings, patient safety is frequently compromised by the prevalence of medication errors. These severe errors are often preventable. Webster and Perry note that, in the elderly, outpatient medication errors are four times those of inpatient errors and suggest that this problem is under-diagnosed because of providers' limited geropharmacology knowledge. For older people, medications constitute the most common therapeutic interventions for diseases and are very common as a part of health promotion and disease prevention (Vermiere et al., 2001; Park & Jones, 1997; Haynes, McGibbon, Kanani, Brouwers & Oliver, 2005). Though elders comprise 13% of the general population, they consume nearly 30% of all prescription drugs and spend more than $15 billion annually on medication (Black & Hawks, 2005). Also, the average number of prescribed medications increases with age, with older adults filling an average of 12.7 prescriptions per year (Black & Hawks, 2005). The authors note that community dwelling elders may receive eight or more medications a day.

Medication noncompliance in healthcare is a frequent occurrence (Balkrishnan et al., 2004; Haynes et al., 2005). These researchers indicate that up to 50% of elders are noncompliant with prescription drug regimens. Improper medication use may result in adverse effects such as dizziness, which frequently leads to falls. Fall-related injuries among older people cost more than

$20.2 billion annually (Centers for Disease Control and Prevention [CDC], 2004 as cited in Black & Hawks, 2005). Falls also cause 90% of hip fractures, which cost $10 billion a year, and by 2020, the total annual cost of these injuries is expected to reach $32.4 billion (CDC, 2004 as cited in Black & Hawks, 2005).

Health literacy is important since older adults must understand various types of spoken and written discourse that pertains to their health (Sorrell, 2004; Hixon, 2004; Haynes et al., 2000). According to Safeer and Keenan (2005) it is estimated that 25% of the population may not be able to understand written health information. The researchers also noted that older adults have inadequate functional health literacy and they are more likely to have chronic and comorbid conditions. This problem of poor health literacy is so pervasive that the American Medical Association (AMA) is encouraging research on this issue and improving health literacy is one of the Healthy People 2010 goals (as cited in Safeer & Keenan, 2005).

According to Lauber, Nordt, Falcato, & Rossler (2003), for proper health maintenance and health promotion, it is critical that the following be clearly understood: (1) instructions for taking certain medications; (2) compliance with medication regimen; (3) purpose of drug, action, and side effects; and (3) food and drug interactions. The ability to read and understand health information has been identified as a critical factor in maintaining independent activities of daily living (Kalichman et al., 2000; Johnson, Diab, Kim, & Kirschblum, 2005; Benson & Forman, 2002; Meadows, 2000). Poor health literacy appears to transcend educational level, gender, socio-economic status, and health status (Baker, Gazmararian, Sudano, & Patterson 2000; Benson & Forman, 2002; Schillinger, Barton, Karter, Wang, & Adler, 2006). Some evidence indicates that low health literacy may be related to perceptual, sensory, and cognitive decline that occurs with normal aging (Hertzog & Hultsch, 2000).

Consequences of Medication Noncompliance

Consequences of noncompliance in older people include: 1) negative effects on health outcomes, 2) multiple drug interactions, 3) depression, 4) liver and kidney toxicity, and 5) inefficacy of treatment regimens leading to hospital re-admissions, which may result in an increase in healthcare costs.

Negative Effects on Health Outcomes

Noncompliance has negative effects on health outcomes because older people have chronic conditions and are subject to multiple co-morbidities (Clark et al., 2003; Fang, Machtinger, Wang, & Schillinger, 2006; Morrow et al., 2006). Noncompliance negatively impacts individuals with chronic conditions and immuno-compromised status such as older people (Safeer & Keenan, 2005; Gazmararian, Williams, Peel, & Baker, 2003; Nevins, Kruse, Skeans, & Thomas, 2001). Often when elders encounter unfavorable effects they may stop taking the medication without consulting with their health care provider (Fodor et al., 2005). Others stop taking the medication the moment they start feeling better. This strategy is ill-advised, especially in the case of antibiotic medications, because when clients fail to take all of their antibiotic medications, certain strains of bacteria develop drug resistance resulting in super infections (Kozier, Erb, Berman, & Snyder, 2004). Drug resistance in older people is unfortunate because this population is more susceptible to infections than younger people, due to their immune-compromised status.

Voluminous literature documents the negative effects of medication noncompliance on older adults' medical outcomes (Kardas, 2000; Schillinger et al., 2006; Kim et al., 2001; Chew, Bradley, & Boyko, 2004; Morris, McLean & Littenberg, 2006; Reynolds et al., 2004). Studies show that medical noncompliance has a negative impact on health management, nutrition,

elimination, electrolyte imbalance, and metabolism (Nemeth, 1998). In a cohort of renal transplant patients, Nevins, Kruse, Skeans, and Thomas (2001) found that medication noncompliance to medications led to acute rejection and outcomes. Similarly, Fodor et al. (2005), found that noncompliance with antihypertensive medication was a key factor in the failure of antihypertensive therapy.

Multiple Drug Interactions

Multiple drug interactions may lead to noncompliance since noncompliance also means taking too much medication (Meadows, 2000). Because the elderly tend to take more medications, including psychotropic drugs, they are more susceptible to multiple drug interactions (Praska, Kriplani, Seright, & Jacobsen, 2005). Many psychotropic drugs, for example, act by modulating neurotransmitters such as serotonin, norepinephrine, dopamine, acetylcholine, and glutamate (Black & Hawks, 2005). Overuse and abuse of sedatives and anxiety-reducing medications, result in excessive drowsiness, confusion, constipation, and disorientation in older people, frequently resulting in falls and other injuries. When elders stop taking their psychotropic medications prematurely, serious withdrawal effects are also likely to occur (Black & Hawks, 2005). Withdrawal effects are seen in “serotonin syndrome” or an uncontrollable shaking. This is managed only when the individual resumes taking their medication. A similar effect is seen in schizophrenic patients who stop taking their lithium, or do not have follow-up blood work to see if they have accumulated toxic levels of the lithium chloride (Black & Hawks, 2005). It would appear that inappropriate use of some psychotropic drugs may lead to maladaptive behaviors in older people.

Depression and Self-Rated Health

Reynolds et al. (2004) found that depression is the strongest correlate of noncompliance and that medications to treat chronic illnesses may intensify depression. These researchers noted that physiological changes with aging may also intensify the effects of antidepressant medications. In addition, depression from multiple medications often masks symptoms for other chronic conditions. For example, symptoms from dementia, stroke, and Parkinson's disease overlap or mimic symptoms of depression. According to the National Institute of Mental Health (NIMH, 1999) (as cited in Meadows, 2000), more than two million Americans over age 65 suffer from depression. Research shows that noncompliance because of depression negatively influences individuals' perceptions about health and quality of life (Bane, Hughes, and McElnay, 2006). In another study, Reynolds et al. (2004) found a positive correlation between compliance and scores on self-rated health, emotional function, cognition, social support, and effectiveness of role functions.

Liver and Kidney Toxicity

Older people may metabolize or excrete the drugs more slowly than younger people, so they require lower dosages of medications (Kozier et al., 2004). As previously stated, age-related physiologic changes in the geriatric population lead to diminished drug absorption, distribution, as well as slowed metabolism, and ineffective elimination. In elders, the breakdown of drugs is affected by the size of the liver and the effectiveness of the circulation, so that drugs stay in the body longer and may show prolonged responses. Because of decreased liver and kidney function, lower doses are prescribed for older people. In fact, older people generally require only half the dose of a younger person (Meadows, 2000). When medication is overused it may cause

poisoning of the kidneys and liver toxicity (Porth, 2004). On the other hand, if the medication is under-used to make it last longer, the drugs never reach therapeutic levels so the body does not get the intended benefits of the medications. When this strategy is used, older adults become more susceptible to possible drug interactions because of the varying half-life of each medication (Porth, 2004).

Hospital Admissions/Economic Consequences

According to Nemeth (1998) and Safeer and Keenan (2005), noncompliance increases healthcare costs significantly. These researchers provide evidence that noncompliance has far-reaching effects on taxpayers since chronic illnesses such as diabetes, hypertension, and cardiovascular disease are implicated in noncompliance to medication regimens. For example, Safeer and Keenan (2005) found that many hospital admissions result in an additional $69 billion in healthcare costs annually. Noncompliance affects both the individual and the society at large because of the rising costs of re-hospitalizations (Fodor et al., 2005).

Causes of Medication Noncompliance

Noncompliance in elders has many causes, including: 1) poor health literacy; 2) locus of control / the patient's attitudes and health beliefs; 3) drug cost; 4) the quality of the therapeutic relationship between the physician and the client; 5) problems accessing adequate healthcare because of provider locations and lack of transportation for those who no longer drive and those who cannot afford their own transportation; 6) complexity of the medication regimen; and 7) polypharmacy and medication side effects. In this study, special emphasis will be placed on the impact on compliance of health literacy and locus of control. I will now explore in depth the different causes of medication noncompliance as outlined at the beginning of this paragraph. More emphasis will be placed on the key variables of health literacy and locus of control and

then I will address the other indirect causes of noncompliance such as drug cost; quality of physician /client relationship; lack of access; complexity of medication regimen; polypharmacy; and medication side effects.

Poor Health Literacy

Voluminous literature demonstrates that noncompliance in older people is due in large part to poor health literacy (Roth & Ivey, 2005; Sentell & Halpin, 2006; Morris, McLean & Littenberg, 2006; Wallace, Rogers, Roskos, Holiday, & Weiss, 2006; Andrus & Roth; 2002; Gazmararian et al., 2000; Gazmararian et al., 2006; Haynes et al., 2005). Evidence shows that poor health literacy is an important factor affecting medication noncompliance in older adults (Chew, Bradley, Flum, Cornia, & Koepsell, 2004; Davis et al., 2006; Davis et al., 2006a; Roth & Ivey, 2005). These researchers found that adults with adequate health literacy were more compliant with medical regimens that those with poor health literacy. Their research also showed that older adults had lower health literacy compared with young adults and were more likely to have difficulty reading labels and understanding instructions (Hoffmann & McKenna, 2006; Davis et al., 2006; Benson & Forman, 2002; Baker et al., 2000; Gazmararian et al., 2000). Sorrell (2004) showed that knowledge deficits included lack of information regarding adverse drug reactions and interactions, lack of information on efficacy of specific therapies, and general uncertainties regarding the medications.

Poor health literacy limits knowledge of risk factors, causes of disease, and limits individuals' ability to seek health information that may promote health and prevent disease (Servellen et al., 2003; Wallace et al., 2006; Davis et al., 2006; Smith & Haggerty, 2003). Low health literacy reduces one's ability to manage health (Nath, Sylvester, Yasek & Gunel, 2001; Hoffman & McKenna, 2006) and therefore individuals age less successfully (Gazmararian et al.,

2000). According to Lauber et al. (2003), health literacy is contingent on utilization of treatments that may be available to individuals (Montalto & Spiegler, 2001). In the absence of adequate health literacy skills, appropriate health–seeking behavior diminishes considerably (Fisher & Goldney, 2003; Davis et al., 2006).

As previously stated, poor health literacy is a powerful predictor of depression symptomatology in older adults (Gazmaraian et al., 2000; Baker et al., 2000). Some research shows that older adults with poor health literacy are more likely to show major depressive symptoms, than their counterparts with adequate health literacy (Gazmararian et al., 2000; Baker et al., 2002). In fact, this research shows that older adults with inadequate health literacy are more than twice as likely to be depressed, compared to their health literate counterparts; and that high incidences of low health literacy among elderly populations may lead to increased levels of depressive symptoms.

Gazmararian et al. (2000) interviewed 3260 Medicare enrollees over a six-month period. These older adults had a high prevalence of chronic conditions. Depression symptoms were measured using the Geriatric Depression Scale. The authors found that 13% of the respondents were classified as depressed. In this study, individuals with poor health literacy were 2.7 times more likely to be depressed relative to the population of elders with adequate health literacy skills.

Nyatanga (1997) argued that medication noncompliance should not be construed as an act of defiance. Nyatanga found that psychosocial theories such as depression were helpful in explaining and understanding non-compliance in medication regimens. Nyatanga (1997) found that depression was associated with noncompliance with medication regimens. Also, the results of these studies provide evidence that elders with poor health literacy skills are more likely to

report major depressive symptomatology, and older adults with depression are more likely to be noncompliant with their medications.

Recent research showed that the problem of poor health literacy was present in affluent, predominantly college-educated communities (Benson & Forman, 2002). In this study, 93 residents were administered the Test of Functional Health Literacy in Adults (TOFHLA). The residents had a mean age of less than 70 years, were not acutely ill, had no known loss of mental functioning, were better educated and had a high standard of living compared to national standards. The authors found that 30% of the group was unable to adequately comprehend common written health care information as measured by the TOFHLA. These researchers were especially alarmed by the poor comprehension of an informed consent document. They demonstrated that of those with poor comprehension, only 68% could understand prescription directions as labeled on medication bottles (Benson & Forman, 2002).

Other studies (Baker et al., 2002; Gazmararian et al., 2000), have shown that adults with low health literacy reported lower scores on the Mini Mental Status Exam (MMSE), indicating that low health literacy, measured using the Short Test of Functional Health Literacy in Adults (S-TOFHLA) may result from true differences in cognitive functioning. The researchers found that functional health literacy was related to MMSE scores across the entire range of S-TOFHLA scores. MMSE scores were not adjusted for an individual's functional health literacy because the researchers felt that it would mask true differences in cognitive functioning.

Current findings indicate that poor health literacy is not necessarily a function of educational attainment or poverty status (Baker et al., 2000; Benson & Forman, 2002; Gazmararian et al., 2000). Declines in memory predispose older people to low health literacy because older people have more difficulty remembering and must employ strategies to compensate for memory

deficits (Hertzog & Hultsch, 2000). These researchers found that older adults also seem to be disadvantaged with regard to time-based prospective memory tasks. As noted by the researchers, prospective memory involves remembering to do something or perform an action in the future. One example of prospective memory is remembering to take medication at a certain time in the future.

Health literacy is important to the general health status of older adults, since, on a daily basis, they must understand various types of spoken and written discourse that pertains to their health (Bass, Wilson, & Griffith, 2003; Benson & Forman, 2002; Fisher & Goldney, 2002; Gazmararian et al., 2006; Conlin & Schumann, 2002; Rothman et al., 2006). According to Lauber et al. (2003), for proper health maintenance and health promotion, it is critical that the following be clearly understood by older people: (1) instructions for taking certain medications; (2) purpose of drug, action, and side effects; and (3) food and drug interactions.

Health Locus of Control

Health Locus of Control (HLC) is defined as one's belief that the state of one's health is determined by internal or external factors, as well as, the level of perceived control over desired outcomes (Bane, Hughes, & McElnay, 2006; Takaki & Yano, 2006; McDonald-Miszczak, Maki, & Gould, 2000; Howat, Veitch, & Cairns, 2006; Sakar, Fisher, & Schillinger, 2006). The construct of HLC and the instrument designed to measure it, the Multidimensional Health Locus of Control (MHLC) (Wallston, Wallston, & DeVeils, 1978), explore the extent to which people believe their health is determined by internal or external factors. HLC theory consists of three dimensions: 1) Internal HLC, 2) Powerful Others HLC, and 3) Chance HLC (Wallston et al., 1978). Internal versus external locus of control is the generalized orientation that has received the most attention.

Most of the original research using HLC and MHLC tended to ignore situational factors and showed that internals were more proactive and thus, more likely to take charge of their health and change undesirable situations (Wallston et al., 1978***).*** That is, individuals who scored highly on IHLC as "internals" were more likely to engage in health behaviors and were more knowledgeable about their health problems. Bairan (1985) found that people who valued health highly exhibited more health seeking behaviors and tended to take matters in their own hands concerning their medication regimen. Bairan also found that internals were more noncompliant compared to other groups. Molassiotis et al. (2002) found that HLC was a factor associated with compliance to medication regimens. Takaki and Yano (2006) found that individuals with higher self-efficacy scored highest on attributing their health outcomes to their personal control and reported more health seeking behaviors. However, Snyder (2006) and Banes, Hughes, and McElnay, (2006) found that individuals who attributed their health status to internal factors were more noncompliant in medication taking.

Howat, Veitch and Cairns (2006) found that people who scored highly on Powerful Others HLC generally believed that health professionals could control one's health outcomes. Therefore those with high Powerful Others HLC scores were more compliant with medication instructions (Howat, Veitch & Cairns, 2006). O'Hea et al. (2005) also found that individuals who believe their health control lies with their physicians will be more likely to follow their physicians' instructions and turn decisions over to those they think control their health. These findings indicate that if individuals believe that the status of their health is determined by powerful others , such as physicians, then these elders may believe that self-initiated health behaviors may be useless O'Hea et al. (2005) found that Chance HLC was inversely related to poor health and also inversely related to knowledge about health problems in both cardiovascular and oncology

patients. Snyder (2006) found that Chance HLC helped to explain patient responses to health issues. This researcher provided evidence that in both the general population and persons with venous ulcers, less compliance was observed in persons with chance orientation. Based on his findings, Snyder concluded that people who scored high on Chance HLC may believe that health is the outcome of chance or luck; therefore following prescription instructions may not help, so they do not comply with medication regimens. McDonald-Miszczak, Maki, and Gould, (2000) also found a negative relationship between Chance HLC, health value, and medication misuse. According to these researchers, people who scored high on Chance HLC generally believed that health was related to chance or luck; therefore following prescription instructions would not help, so they did not comply with medication regimens.

O'Hea et al. (2005); Bane, Hughes, and McElnay (2006); and Takaki and Yano (2006) found that psychosocial factors, such as locus of control, are helpful in explaining and understanding non-compliance in medication regimens. These researchers stated that non-compliance may be associated with HLC and that healthcare providers need to understand these psychosocial reasons for noncompliant behavior to prevent lapses in the medical regimens.

Other Causes of Medication Noncompliance

Lack of Access

According to Chisholm (2004) and Meadows (2000), lack of access to transportation is the reason most frequently cited by older people for broken doctor appointments. Some elders can no longer drive, and some cannot afford their own transportation. Often elders may have limited access because their healthcare providers are not located in close proximity to where they live. Older people with physical disabilities and limited mobility need assistance to fill prescriptions and get to their follow-up appointments (Sorrell, 2004; Meadows, 2000). According to

Meadows, follow-up care is important to prevent medication noncompliance. At follow-up appointments, healthcare providers have an opportunity to observe whether clients understand medical regimens, proper administration, intended effects, side and toxic effects of the regimen, and how to treat serious problems associated with medication (Meadows, 2000).

Drug Cost

According to Chisholm (2004) and Mathieson, Kronenfeld and Keith (2002), medication costs continue to rise, and a substantial number of older people either do not have insurance coverage, or lack adequate coverage. Despite the new Medicare Drug Benefit, many older adults still are forced to pay for many medications out of pocket since insurance formularies do not include some drugs. Many older people have difficulty paying for expensive prescription medications, due to their limited financial resources. According to Meadows (2000), drugs can cost an older patient $300-$400 monthly. For example, Chisholm (2004) found that drug cost is also a significant problem for some renal transplant patients because they could not afford expensive prescription medications due to inadequate insurance coverage. Evidence indicates that inability to pay for medications leads to noncompliance because elders cut their medications in half, hoard expired medications or take them every other day to make them last longer (Praska et al., 2005; Meadows, 2000).

Quality of Physician-Client Relationship

Safeer and Keenan (2005) found that the quality of the physician-client relationship was reflected in noncompliance with the medication regimen. Similarly, Smith and Haggerty (2003) found that the way medication information was disseminated by the healthcare provider impacted medication noncompliance. For example, the physician sometimes made verbal changes to the regimen without communicating the change to the pharmacy, or the physician did

not have complete information about the patient's current medications. Patients' misuse and lack of understanding of medical terminology also led to medication noncompliance. The author indicated that even physicians sometimes did not know all the information about a drug therapy, despite advances in technology and pharmacology.

Physicians make behavioral errors by frequently ordering prescriptions over the phone without examining the patients, by inappropriate dosing, and by failing to get a history of medications and current drug use from elderly clients (Chew et al., 2004; Kim et al., 2001; Davis & Wolf, 2004). Often, physicians do not instruct the patients adequately about the condition for which the drug is used, the pharmacodynamics of the drugs, adverse effects, and how long the drug should be taken (Chew et al., 2004; Kim et al., 2001; Davis & Wolf, 2004). Much generalization in how medication is administered exists, especially in geriatric populations (Davis et al., 2006; Reynolds et al., 2004).

Good communication between the patient and the health care provider will lead to greater compliance and improved outcomes (Praska et al., 2005). Doctors and pharmacists should tell patients what three times a day means: evenly spaced intervals over a 24 hour period. Healthcare providers should explain whether a dose should be taken in the middle of the night or not taken in the middle of the night. The healthcare delivery system needs to be improved so that a collective effort is made, to provide qualified advice, so patients receive sufficient information about their own drug therapy. A more individualized versus generalized approach in medication administration for older people is needed.

Complexity of Medication Regimens

Haynes et al. (2005) noted that complex medication regimens are precursors to noncompliance, due to patients forgetting to take their medication or omission of doses. Older

people must take medications for longer periods of time, utilize drugs differently based on age-related pharmacokinetics, and they have to assimilate more medication information with more deficits in memory and cognition (Wilson 2000). Medications such as lithium and antidepressants require daily administration for one to several weeks, before their intended effects are evident, while other medications such as benzodiazepines and anti-psychotics have a more immediate onset of action. Appropriate laboratory tests must be conducted to prevent serious complications and assure safe and therapeutic levels of the medications (Kozier et al., 2004). Elders sometimes neglect this important component of the medication regimen.

In older Parkinson's patients it was demonstrated that "off-again, on-again" dosing was more effective in maintaining therapeutic dopamine levels than continuous dosing (Stuart & Laraia, 2005). If Parkinson's patients did not comply with the "off-again, on-again" dosing, their disease was more poorly managed. The authors showed that single doses are more likely to be adhered to than multiple daily dosing. These authors indicated that alternating dosing schedules produced 50% compliance and weekly dosing 29% compliance.

Polypharmacy

Older people sometimes fail to give the doctor complete information about all medication use. Therefore, physicians often lack information regarding what medications other healthcare providers have prescribed for their older clients. In addition, many older people shop around for cheaper prices and so their medication records are in several pharmacies (Meadows, 2000). This researcher provides evidence that older people may fill prescriptions from two different doctors for the same medications. According to Meadows, one doctor may write a prescription for brand name Valium and the other doctor may order the generic version, diazepam. This same medication comes in different color pills and different strengths so if both are filled, the patient

unknowingly may take them both, with disastrous results. When patients use different pharmacies to procure their medications, they often fail to receive important regarding drug interactions (Praska et al., 2005). For example, patients may not realize that herbs and OTC medicines can interact with prescription drugs. One example is St. John's Wort, an herb that interacts with theophylline, a bronchodilator, or agent that opens the airways. The herb compromises the effects of this drug in asthma patients and may lead to negative outcomes (Meadows, 2000).

Medication Side Effects

Older people may refuse to take medications because of the unpleasant or distressing side effects such as nausea, vomiting, diarrhea, confusion, or skin rash. For example, Balkrishnan et al. (2004) found that outcomes in a Medicaid-enrolled, Type 2 diabetic population varied depending on the side effects of the diabetes medication used. Schillinger et al. (2002) found that participants were more compliant if one particular oral antidiabetic medication was used versus another brand. Similarly, Balkrishnan et al. (2004) argued that patients were more likely to take thiazolidinedione (TZD) versus metformin or sulfonylureas because TZD had less unpleasant side effects, such as, nausea and vomiting, dermatitis, and diarrhea. Balkrishnan et al., (2004) also found that TZD resulted in significantly improved treatment adherence compared to other medications. The researchers noted that noncompliance with drugs like metformin is associated with more diabetic crises, resulting in costly emergency room visits and hospitalizations. They concluded that use of TZD, which causes fewer unpleasant side effects, may lead to fewer diabetic crises, and help lower healthcare costs.

Research shows that elderly clients are more susceptible to side effects, especially cardiac effects, such as increased heart rate and ineffective pumping action of the heart (Schwartz,

Woloshin & Welch, 2005). A confounding factor in the effectiveness of drug therapy is related to age-related body system changes. This is because, as people age, the ways medications are absorbed, distributed, metabolized, and eliminated change considerably (Black & Hawks, 2005). Drug absorption is slowed by age-related changes in stomach emptying, changes in stomach acidity, the speed at which the drug moves through the gastrointestinal tract, and nutritional status. Therefore, the medication stays in the stomach or intestine longer and takes longer for the therapeutic effect to be obtained. Age-related changes in the adequacy of the circulatory system, and the ability of the drug to enter the cell, impact the way the drug is distributed throughout the body (Gazmararian et al., 2003). These changes may result in higher than usual blood levels of the drug, resulting in toxicity and less drug reaching the site of action due to storage in the fatty tissues.

Research Questions

Based on the literature review describing links among health literacy, health locus of control, and medication noncompliance the following research questions are posed:

Question 1**:** What is the relationship of health literacy to older African Americans' compliance with prescription medications?

Question 2**:** Is health locus of control associated with medication compliance in older African Americans?

Chapter Three: Methods

Study Design

This study used a cross-sectional, correlational design to investigate the relationship of health literacy and locus of control to medication noncompliance by African American older adults. In this study I used a survey approach which has been shown to be an appropriate method for studying non-compliance and obtaining older adults' self-reports regarding health literacy (Baker et al., 2002; Gazmararian et al., 2000). The surveys were administered in-person. This format was necessary to ensure correct administration of some of the scales in the questionnaires. Additionally, the in-person format helped to minimize missing data.

Participants

Participants were recruited from a large metropolitan church in the greater Atlanta area. This church caters to the African American population and has a congregation of approximately 700. Eligibility for participation included identifying as African American, being at least 45 years of age, and taking at least one prescription medication. Potential participants with serious illness, such as terminal cancer or psychosis as determined by health history and current medication regimen, were excluded from the sample. The resulting convenience sample included 30 participants.

Assessment Tools

The data collection instruments for this study were: 1) Hill Bone Compliance Scale, 2) Test of Functional Health Literacy in Adults (TOFHLA), 3) Rapid Estimate of Adult Literacy in Medicine (REALM), 4) Multidimensional Health Locus of Control (MHLC), and 5) An

investigator-developed demographic and health characteristics questionnaire with questions on perceived health status.

The Hill Bone Compliance Questionnaire was used to measure medication taking, appointment keeping and sodium intake compliance (Kim, Hill, Bone & Devine, 2000). The original scale consists of 14 items with subscales that measure the frequency of behaviors related to medication taking (9 items, possible scores of 0 - 18); appointment keeping (2 items, possible score of 0 - 4), and salt intake (3 items, possible score of 0 - 6).

In the current study three possible responses categories were created which scored from 0 to 2 for each item. Total scale scores ranged from 0 to 28, with higher scores indicating less compliance. In prior research, the Hill Bone scale has adequate reported reliability (Cronbach's alpha .74 - .84) and construct and predictive validity were established in two clinical studies (Kim et al., 2000). In the current study, the reliability for the total scale also was adequate (Cronbach's alpha 0.77). Total scores for the entire instrument as well as subscale scores were examined.

Measures of health literacy were assessed by two instruments, the TOFHLA and the REALM (Gordon, Hampson, Capell, & Madhok, 2002; Shea et al., 2004). The TOFHLA assessed patient comprehension of medical information/ terminology while the REALM assessed literacy level in English. The REALM is a reading-recognition test. Therefore, I used the numeracy component of the TOFHLA to assess patient understanding since reading recognition does not imply comprehension or proper interpretation of health information (Chew et al., 2004).

The numeracy component of the TOFHLA (Gazmararian et al., 2000) is an eight item test designed to measure participants' recognition and understanding of medication instructions on prescription labels. The TOFHLA numeracy component uses actual materials that patients might

encounter in a health care setting to test their understanding of medication instructions. Prescription labels with instructions such as “take one tablet by mouth 4 times daily” are used when administering the instrument. The participants were asked to answer questions posed about the medication instructions. Two points were given for each correct answer, and one point was given for each incorrect answer. Possible raw total scores ranged from 8-16 and the raw score was converted to a percentage score (0 – 100). Scores that were equal to or greater than 75% indicate good comprehension and high functional health literacy. A score less that 75% indicates poor comprehension of written health information and low functional health literacy (Benson & Forman, 2002).

The REALM is a reading recognition test and was developed to assess an adult patient’s ability to read and recognize common medical words and lay terms for body parts and illnesses (Davis et al., 1991). According to the authors, the REALM has been correlated with other standardized tests of health literacy and reading comprehension. The modified REALM is a 66-item list of medical terminology progressing from simple to more difficult. The REALM is preferred over other measures because it is easily implemented in a variety of clinic populations (Gazmararian et al., 2000). The REALM can be administered in a few minutes by personnel with minimal training and has displayed excellent concurrent validity with standardized reading tests (Servellen et al., 2003). These authors stated that in keeping with the format of the original REALM, the medical terms were chosen because they reflected varying levels of difficulty. The number of correct words in the list was counted and the number was then recorded as the raw score. The total raw score was matched with its grade equivalent. Adequate reliability (0.84) for the reading recognition scale of the REALM has been reported (Servellen et al., 2003).

Health locus of control was measured using the Multi-dimensional Health Locus of Control (MHLC) developed by Wallston et al. (1978). The reliability coefficients range from .83 to .86 (Bairan, 1985). The MHLC consists of 18 statements of health beliefs with responses in a six-point Likert format, ranging from strongly disagree to strongly agree. The six items in each of the three categories (internal, powerful others, and chance) were summed yielding three separate scores. Total scores ranged from 6 to 36 with higher scores indicating more of one dimension versus the other orientations. Individuals were identified based on their overall beliefs as reflected by their highest score on the three subscales. Individuals were identified as having health beliefs predominantly associated with internal control, powerful others, or chance.

Demographic data and information about medications and participants' overall rating of health were obtained through an investigator-developed questionnaire (See Appendix A). The first five items in this questionnaire consisted of items relating to race, gender, age, education, and income. Item six of the questionnaire consisted of several options related to past medical history and participants were required to choose all options that were applicable to them. Items 7 to 10 consisted of questions relating to over-the-counter as well as prescription medication drug use. Items 13 to 15 consisted of scales relating to general health rating, emotional health or sense of well-being rating, and quality of life rating.

Procedure

After receiving approval from the Georgia State University Institutional Review Board (Appendix B), the investigator met with the pastor of the church in his office and explained the purpose and goals of the study. The pastor gave approval to recruit participants at church events and use the church facilities, including but not limited to the fellowship hall. Subsequently, in May, 2007 an announcement about the study was made during one of the church worship

services. The recruitment continued for a three week period. Additionally, the investigator attended three church related events on Sunday, May 19th, 2007. On this occasion, the investigator approached potential participants and gave an explanation of the study. Individuals who agreed to participate were invited to meet with the investigator in a private room adjoining the church fellowship hall. The participants were escorted to a private room to minimize disruption to church activities and ensure confidentiality. Potential respondents were screened to ensure that they met the inclusion criteria. Once eligibility was determined participants were told that the interview would last approximately 30 minutes. The investigator then read the informed consent document to the individual and answered any of the participant's questions. After written informed consent was obtained, the participants were interviewed. The same procedure was used at all three events.

Individuals who agreed to participate in the study, but could not meet at the time were scheduled for subsequent Sundays. The subsequent two Sundays, from 9:00 am to 5:00 pm the investigator met privately with other congregants who volunteered to participate during previous recruitment at church related events. Each interview was conducted following the procedure established the previous week. Recruitment continued until the goal of 30 participants was met. In all cases, all parts of the informed consent form as well as the questionnaires were read aloud to participants to obtain proper informed consent regardless of reading ability. The demographic questionnaires, the REALM and the TOFHLA were administered by the investigator and the Hill Bone was self-administered. Participants were instructed not to talk among themselves nor discuss the answers with any other person.

Statistical Analysis

Data were analyzed using the Statistical Program for the Social Sciences (SPSS) software application version 15.0. I calculated descriptive statistics, including measures of central tendency such as mean and standard deviation, for sample characteristics and main variables of interest. The dependent variable was medication compliance and the independent variables were health locus of control and health literacy level. Reliability was assessed using Cronbach's alpha for scales where appropriate. Spearman rho correlations were used to examine relationships between key variables. I used independent samples *t*-tests to compare scores on medication compliance between two groups (that is, participants who had high functional health literacy versus those who had low functional health literacy; participants who attained high school reading equivalency versus those who attained less than high school reading equivalency).

Chapter Four: Findings

Results

Sample

The sample consisted of 30 participants. Participants ranged in age from 45 to 73, with an average age of 54 (SD = 6.12) years. Most had at least a high school education. The majority (53%) self-identified as West Indian. More than half (60%) had an income of $35, 000 or higher (see Table 1).

Approximately one fifth of the participants have a history of high blood pressure and diabetes. More than one half reported taking only one prescription medication with others reported taking two or more prescription medications. The majority of the participants (63%) took their prescription medications once daily and 37% took prescription medications twice or more daily. Seventy six percent of the participants had seen their Primary Care Physician (PCP) within the last six months. Most participants rated their general health as good to excellent, few reported their health as fair. In terms of emotional health, most participants rated their emotional health as good to excellent. The vast majority (96%) also reported good to excellent quality of life (QOL) (See Table 2).

Descriptive Statistics of Reading Comprehension and Health Literacy

Table 3 provides categorizations of participants' scores on each individual item of the TOFHLA numeracy section. Participants are grouped according to their comprehension level on this test. Those who had TOFHLA scores of 75% or higher are labeled "good comprehension" and those who had TOFHLA scores of 74% or lower are labeled "poor comprehension."

Table 4 provides a comparison between participants' scores on the TOFHLA numeracy test and the REALM, a test of reading recognition. Sixteen participants (53.3%) had poor comprehension of written health care information (i.e. achieved a TOFHLA score of 74% or less). Of these 16 participants (14 were women and 2 were men). The mean age of participants with poor comprehension was 53 (SD = 6.12).Fourteen participants (47%) had good comprehension of written health care information. The mean age of participants with good comprehension was 54 (SD = 6.12). Scores on the REALM showed that most participants displayed greater than a high school reading level (70%), with 30% having less than high school reading level.

Table 5 provides a comparison of REALM scores based on the education level of the participants. Of the 26 participants who had a high school degree or higher, seven had less than a high school reading level according to the REALM classification.

Health Locus of Control

Findings form the Multi-dimensional Health Locus of Control (MHLC) showed that 83% of the participants (N = 30) had an Internal health belief orientation; few were categorized as having a Chance (n = 2) or Powerful Others orientation (n = 3). Because of the small numbers of participants who fell in the Chance and Powerful Others categories, I was not able to make meaningful comparisons among these groups. Therefore, no further analyses were conducted using the MHLC.

Medication Compliance

Participants' scores on the three subscales of the Hill Bone Compliance scale are shown in Table 6. Overall the means were low indicating relatively good medication compliance. However, based on the strict ranges for scoring the Hill Bone Compliance subscales (noncompliance = a score of < 1) the majority (83%) were not compliant with medication taking.

Table 7 shows results of independent samples *t*-tests that tested differences in medication compliance between two subgroups of participants that were divided based on : 1) scores on the numeracy component of the TOFHLA (less than high school reading level versus greater than high school reading level). No statistically significant difference was found between these groups.

For descriptive purposes, I conducted an item level analysis based on the scores of the Hill Bone medication subscale (see Table 8). Results show that more than half of the participants in the poor comprehension group were noncompliant with four items (running out of medication, missing medications when feeling better, missing medication out of carelessness, and deciding not to take medication). More than half of the participants in the good comprehension group were noncompliant with two items (missing medication when feeling better and skipping medication before a doctor visit). Participants in both groups were most compliant with: 1) not taking someone else's medications and 2) taking medications when sick, and 3) not forgetting to take medication.

Relationship of Medication Compliance with Sample Characteristics

Relationships among key variables were explored using Spearman's rho correlations. Worse medication compliance (higher score) (Hill Bone Medication subscale) was related to lower income (r_s = -.50 at the p =.005 level); worse appointment keeping was related to worse quality of life (r_s = -.40, p = 0.029). Worse compliance with salt intake was related to lower medication compliance (r_s = 0.44, p = 0.015) and higher age was related to lower salt intake (r_s = -.38, p = .038). Gender was related to higher income, (r_s = .63, p <.005); and higher education was related to higher income (r_s = .67, p <.0005). Participants' rating of their better general

health was associated with better emotional health (r_s = .44, p = .014). Better QOL was associated with better emotional health (r_s = .51, p = .004).

Table 1. *Descriptive Statistics of Sample Characteristics (N = 30)*

Variables	n (%)
Gender	
Male	6 (17)
Female	25 (83)
Education	
< High School	4 (13)
≥ High School	26 (87)
Income	
≤ 34,999	12 (40)
≥ 35,000	18 (60)

Table 2. *Participant Health History and Health Ratings*

Variable	N (%)	M (SD)
Co-morbidities:		
High Blood Pressure	8 (26.7)	
Diabetes	7 (23.3)	
Heart Disease	3 (10)	
Other	12 (40)	
Number of Prescriptions:		M 1.47 (0.7)
1 prescription medication	19 (63)	
2 or more medications	11 (37	
General Health:		M 3.63 (0.09)
Fair	1 (3)	
Good	15 (50)	
Very good	8 (27)	
Excellent	6 (20)	
Emotional Health:		M 3.77 (0.80)
Fair	1 (3)	
Good	10 (30)	
Very good	14 (47)	
Excellent	5 (20)	
Quality of Life:		M 3.3 (0.5)
Fair	1 (3)	
Good	19 (63)	
Excellent	10 (33)	

Table 3. *Reading Comprehension Level and Interpretation of Medication Instructions*

TOFHLA Numeracy items	Poor Comp. N (%)	Good Comp. N (%)
4 times a day dosing schedule	0 (0)	3 (21)
Expiration date of medicine	0 (0)	6 (42)
3rd day dosing schedule	6 (38)	8 (57)
Normal blood sugar value	12 (75)	11(79)
Next appointment is scheduled	13 (81)	9 (64)
Number of pills to take	5 (31)	9 (64)
Prescription to be refilled	6 (38)	11 (79)
Empty stomach	5 (31)	11 (79)

Note: Poor Comp. = poor comprehension; Good comp. = good comprehension. The table lists the number and percentages (in parentheses) of subjects with poor comprehension (TOFHLA scores < 75%) and good comprehension TOFHLA scores ≥ 75%) who correctly answered the listed items. Format adopted from Benson and Forman, 2002.

Table 4. *Descriptive Statistics of Health Literacy Measures*

Variables	N (%)
TOFHLA: Test of functional health literacy	
Poor comprehension (Score of < 75)	16 (53)
Good comprehension (Scores of ≥ 75)	14 (47)
REALM: Test of reading recognition	
< 9th grade reading (Score of < 60)	9 (30)
≥ high school reading level (Score of 61 – 66)	21 (70)

Table 5. *Comparison of REALM score to Formal Education Completion*

Variables	< HS education Formal education	HS graduate Formal education
	n (%)	n (%)
REALM < HS reading level	2 (7)	7 (23)
≥ HS reading level	2 (7)	19 (63)

Table 6. *Descriptive Statistics of Hill Bone Compliance Scale*

Hill Bone Subscales	**M (SD)**	**N (%)**	**Possible score**
Medication:	M 4.30 (2.91)		0 - 18
Compliance:		5 (17)	
Noncompliance: (score of ≥ 1)		25 (83)	
Appointment :	M 1.53 (0.78)		0 - 4
Compliance:		4 (13)	
Noncompliance: (score of ≥ 1)		26 (87)	
Sodium Intake :	2.23 (1.10)		0 - 6
Compliance:		2 (7)	
Noncompliance: (score of ≥ 1)		28 (93)	

Table 7. *Comparison of Health Literacy Levels on Medication Compliance*

Variables	**Mean (SD)**	***t***	***p* value**
TOFHLA			
Poor Comprehension	4.44 (2.90)	.272	.78
Good Comprehension	4.14 (3.04)	.271	.78
REALM			
< HS reading level	5.11 (2.52)	.998	.33
≥ HS reading level	3.95 (3.06)	1.08	.29

Table 8. *Health Literacy and Medication Compliance*

Hill Bone Medication Subscale	**Poor comprehension** compliant vs. Noncompl (n=16) N (%)		**Good comprehension** compliant vs. Noncompliant (n=14) N (%)	
Forgetting to fill Rx	8 (50)	8 (50)	8 (57)	6 (43)
Running out of Rx	7 (44)	9 (56)	8 (57)	6 (43)
Missing Rx when better	7 (44)	9 (56)	6 (43)	8 (57)
Missing Rx when sick	10 (62)	6 (38)	9 (64)	5 (36)
Taking others Rx	14 (38)	2 (62)	13 (93)	1 (7)
Missing Rx when careless	7 (44)	9 (56)	9 (64)	5 (36)
Forgetting to take Rx	11 (69)	5 (31)	8 (57)	6 (43)
Deciding not to take Rx	7 (44)	9 (56)	9 (64)	5 (36)
No Rx before Dr.'s visit	8 (50)	8 (50)	6 (43)	8 (57)

Note: Rx = Prescription medications; Noncompl. = Noncompliant. The table lists the number and percentages (in parentheses) of subjects with poor comprehension and good comprehension who were compliant or noncompliant with listed Hill Bone medication subscale items.

Chapter Five: Discussion and Conclusion

The current study was designed to address the relationship of health literacy and locus of control to medication compliance in older African Americans. Using data collected from a convenience sample of 30 African Americans over 44 years old, the investigator found: 1) Health literacy is positively associated with older African Americans' compliance with prescription medication and 2) Health locus of control is a key factor in older African Americans' compliance with prescription medications.

Sample Characteristics

The sample in this study was relatively well educated, not acutely ill, had a relatively high standard of living, and was relatively younger than other samples in other health literacy studies (Benson & Forman, 2002; Gazmararian et al., 2000). This sample was recruited from a church and reported high levels of positive emotional health, quality of life and overall good general health. Almost 27% of the sample reported a history of high blood pressure and more than one third took two or more prescription medications. Additionally, 37% of the sample was on multiple dosing regimens, while 63% took their medication once a day. Previous research has shown that better medication compliance is associated with single dosing and multiple dosing. may lead to noncompliance (Meadows, 2000; Safeer & Keenan, 2005). Additional factors associated with medication noncompliance appears to be the complexity of the medication regimen, the degree of medication supervision, monitoring by caregivers and healthcare providers, health status of the patient, and social support available (Safeer & Keenan, 2005). Unlike the larger sample in the study by Safeer and Keenan (2005) on simple medication regimens, the sample in this study reported more noncompliance.

Health Literacy

In the current study, health literacy was measured using the TOFHLA and the REALM. The TOFHLA measures reading comprehension of written healthcare information and the REALM measures reading recognition. Unlike the TOFHLA, the REALM is a reading recognition test, not a test of reading comprehension so participants who attained high school reading level do not always display adequate functional health literacy or good comprehension of health information (Benson & Forman, 2002). Additionally, participants with formal education do not always display good reading recognition as measured by the REALM.

Adequate functional health literacy (score of 75% or greater on the TOFHLA) and a reading equivalency of high school or greater (score of 61 or greater out of a possible 66 on the REALM) indicate that an individual should easily read and understand most healthcare information since healthcare information is written at 10th grade level or greater (Safeer & Keenan, 2005). According to the results from the National Adult Literacy Survey, 22% of US adults function at the lowest literacy skill level defined (3rd grade equivalent) (Benson & Forman, 2002). Safeer and Keenan noted that although most health care materials are written at 10th grade level or higher, most adults read between the eighth and ninth grade level. These researchers found that participants with a reading equivalency of at least high school level as measured by the REALM were able to read most patient education materials.

In the current study, although 87% of the participants attained at least high school formal education, only 47% of those participants achieved good reading comprehension on the TOFHLA. Furthermore, only 70% of the participants who completed at least high school were at a high school reading level or greater. Similarly, although 87% of the participants attained at

least high school formal education, only 63% of the participants read at high school level or greater (see Table 5). Additionally, seven percent of the participants, although completing less than high school, exhibited reading recognition at a high school equivalency level.

Based on these findings, one would expect that most of the participants in this current sample should be able to read and understand healthcare information to allow them to take charge of their health. However, only 17% of the participants reported compliance to medication taking as measured by the Hill Bone medication subscale. Notwithstanding, the participants with good functional health literacy or good comprehension of health information reported medication compliance in seven out of nine items of the Hill Bone medication subscale. Conversely, participants with poor functional health literacy and poor comprehension of health information reported medication compliance in only two of nine items of the Hill Bone medication subscale (see Table 8).

Safer and Keenan (2005) found that in a diabetes Type 2 population, participants with inadequate health literacy reported negative health outcomes such as poorer glycemic or blood sugar control, and higher levels of diseases of the retina compared to their counterparts with adequate health literacy. Safeer and Keenan also found that patients with poor health literacy were less likely to participate in disease prevention and health promotion programs and reported more frequent hospitalizations. Similarly, Georges, Bolton, and Bennett (2004), found that patients with inadequate functional health literacy will have difficulty reading, understanding, and interpreting health information and medication instructions. Sarkar, Fisher, and Schillinger (2006) did not find a significant relationship between high health literacy scores and medication compliance. However, Sorrell (2004) found that patients with poor health literacy also assessed with the REALM and TOFHLA, reported more noncompliance to healthcare protocols and

reported difficulty accessing needed services.

In a study by Benson & Forman (2002), it was found that in a population of affluent, well-educated older adults, 30% of the participants displayed poor functional health literacy. In a study by Hixon (2004), patients with inadequate functional health literacy invariably were noncompliant with their medication regimen. Hixon found that patients without formal education displayed inadequate functional health literacy; frequently attained less than high school reading levels, and did not know how to take their medications properly.

Health Locus of Control

Findings from the current study showed that 83% of the participants had an internal health locus of control, and attributed the status of their health to themselves and not to chance or powerful others. As previously stated, meaningful comparisons of the different orientations of health locus of control were therefore not possible. When characteristics of the participants with an internal HLC were examined, it was found that these participants were frequently noncompliant with their medications. These findings are consistent with the literature that shows that individuals with an internal orientation are people who believe they are in control of their health, and thus, are more likely to deviate from medication regimens (Bane et al., 2006; Takaki & Yano, 2006; McDonald-Miszczak et al. (2000). Individuals with an internal orientation are more proactive, and thus are more likely to take charge of their health and change undesirable situations (Wallston et al., 1978***).*** Sarkar et al. (2006) found a trend toward improved medication compliance with higher self-efficacy scores. In a study by Bairan (1985) it was found that people with an internal orientation were more noncompliant compared to people with an external orientation, that is, powerful others or chance orientation. Similarly, Takaki and Yano (2006) found that individuals who scored highest on the internal dimension of health locus of control,

although they were more likely to engage in health-seeking behaviors and appeared more knowledgeable about their health problems, they displayed more medication noncompliance. Similarly, in this study, individuals who scored highest on the internal dimension of HLC, deviated in some areas of their medication regimens. On the other hand**,** O'Hea et al. (2005*)* found that individuals who possessed the strongest beliefs that their own behaviors controlled their health condition were more compliant and had the highest perceived quality of life.

In previous research individuals who were categorized as having an internal locus of control, were more likely to engage in health behaviors and were more knowledgeable about their health problems (Bane et al., 2006; Takaki & Yano, 2006; McDonald-Miszczak et al., 2000). Although most participants held the belief that they have control over their health, the participants were noncompliant in some areas of taking medications. Specifically, this observation seemed to be true about the following 2 items: 1) not taking medications when they felt that they were feeling good or 2) not refilling medications. This study reported similar results to a study by Bairan (1985) who found that older adults who believe they are in control of their health are more likely to be noncompliant in their medication regimen. This may seem counter intuitive as one might expect those who believe they are in control of their health would take medication appropriately to get the best benefit. The lack of compliance by "believing they know best" reflects a lack of understanding about chronic illnesses such as hypertension that is generally asymptomatic. This inconsistency is a concern as many participants had illnesses with serious consequences with inadequate treatment.

One's health belief may influence one's medication compliance. Positive beliefs about the necessity of medications were associated with a HLC towards powerful others (Bane et al., 2006; Takaki & Yano, 2006; McDonald-Miszczak et al., 2000). People who scored highly on Powerful

others health locus of control believe their health condition is determined by their health care providers, or that health professionals control their health outcomes. In previous research, those who scored highly on this dimension reported more compliance with medication instructions (Howat et al., 2006; Snyder, 2006; McDonald-Miszcak et al., 2000).

In the current study, meaningful comparisons could not be drawn with those who believe they control their health since the vast majority of the participants scored highest on that internal subscale. Bane et al. (2006) provided evidence that older adults who attributed their health status to powerful others were more likely to comply with their medication regimens relative to adults in the other dimensions of health locus of control. If individuals believe that their health status is determined by powerful others such as physicians then these elders may believe that self-initiated health behaviors may be useless (Bairan, 1985). In our sample, few of the participants attributed the status of their health or believed that their health was determined by powerful others such as physicians. People with others orientation believe their health is under the control of their health care professionals.

Holding beliefs that one's health is due to chance has been found to be associated with medication noncompliance in several populations. Snyder (2006) found that this belief about chance was inversely related to health status and also inversely related to knowledge about health problems. If one believes health is by chance then being compliant with medications may not be viewed as necessary.

Nyatanga (1997) found that psychosocial factors such as locus of control, personality, social networks, socialization, levels of growth and development, are helpful in explaining and understanding non-compliance in medication regimens. The author stated that non-compliance may be tied to HLC and that healthcare providers need to understand the psychosocial reasons

for noncompliant behavior such as the person's health belief orientation to prevent lapses in the medical regimens.

Although most of the sample was well-educated and demonstrated a similar reading recognition level, only about half displayed good functional health literacy or good comprehension of written health information as measured by the numeracy section of the TOFHLA. In fact, formal education did not necessarily correspond with one's level of functional health. In a study by Benson and Forman (2002), an affluent geriatric retirement community demonstrated 30% of elders had poor comprehension in a similar testing situation.

The significance of the study lies in the fact that older adults are more likely to be afflicted with chronic illnesses that require medication interventions for positive outcomes (Safeer & Keenan, 2005; Sentell & Halpin, 2006; Morris et al., 2006). In particular, older African Americans continue to experience significant health disparities relating to chronic illnesses such as congestive heart failure and diabetes; lack of access to healthcare and inadequate functional health literacy is an issue for this vulnerable population (Georges et al., 2004; Meadows, 2000; Sarkar et al., 2006). Coupled with that fact, most health care materials are written at a 10^{th} grade reading level and older adults most often read at less than high school reading level. Additionally, older adults display inadequate health literacy because these older adults are more afflicted with age-related problems such as cognition and vision change (Sorrell, 2004; Safeer & Keenan, 2005). These age-related changes influence reading and comprehension levels of older adults. According to Hixon (2004) and Safeer and Keenan (2005), older adults with inadequate functional health literacy are more likely to be hospitalized than older adults with adequate skills. These researchers also found that inadequate health literacy may lead to medication noncompliance because patients may have problems accessing healthcare, following medication

instructions, and problems with medication taking.

Limitations

Although this research will add to the limited literature concerning older African Americans' noncompliance with medical regimens, this research is still preliminary and has several limitations. First, the sample was a convenience sample, which may bias the findings. Second, participants were recruited from one church in Atlanta, Georgia. Therefore, the findings may not be generalizable to other populations. Third, the sample size was small which prohibited the use of more sophisticated analysis approaches.

Fourth, because the study was based on self-reports, medication compliance may have been over- or under-reported. Research has shown that individuals not wanting to be judged by the person administering the questionnaires may provide less than accurate information (Sorrell, 2004). A final limitation is the measures. For example, more objective measures such as pill counts or Medication Electronic Monitoring (MEM) would give more accurate reports of medication compliance. In addition, prescription labels that were used did not reflect some of the improvements of today's improvements with illustrations and color coding. This is significant because age-related changes that afflict elders influence reading abilities (Safeer & Keenan, 2005).

Despite these limitations, study findings may provide a deeper understanding of the correlation between poor health literacy, health locus of control, and medication noncompliance in African American older adults. My study is important because evidence shows that poor health literacy is a problem with older adults, especially older African Americans. Older African Americans experience huge disparities with chronic illnesses, particularly early onset of cardiovascular diseases and diabetes (Sorrell, 2004; Meadows, 2000; Safeer & Keenan, 2005). It

would appear that older African Americans display inadequate health literacy and this has serious effects on medication compliance and health outcomes (Morrow et al., 2006). Schillinger et al. (2002) provides evidence that vulnerable populations afflicted with diabetes have greater incidences of negative health outcomes compared to people with adequate health literacy. Results from the current study indicate that a dynamic interplay between general literacy, health literacy, and medication compliance exists. Poor health communication leads to medical errors so currently a critical need exists for research such as this to better understand the complex interactions between key variables such as health literacy, health locus of control, and medication compliance.

Implications for Health Practices and Future Research

The study findings have implications for healthcare professionals and future research. Although this research is based on a small convenient sample, the findings have several implications for health practices for both professionals and laypersons. First, better instructions and more education may be needed for persons taking medications for chronic illnesses. Pharmacies may need to develop better prescription labels and test these labels with persons with low literacy. Supportive and sensitive care is needed for older adults who are embarrassed about inadequate literacy skills that prevent appropriate access to healthcare information and services. Sorrell (2004) lists several websites such as the Health and Literacy Special Collection; National Center for Family Literacy; and the National Institute for Literacy as valuable resources for the public.

Second, more collaboration is needed so that at each stage of the healthcare delivery process, nurses and other healthcare professionals assume advocate roles for each patient since formal education is not always the best method for assessing patient's readiness for medication

instruction. Although the study findings are preliminary, they shed light on the need for more detailed instructions for patients regardless of their reading ability. Sorrell (2004) states that healthcare professional need to advocate for policy initiatives related to health literacy to address this pervasive problem of poor health literacy. Physicians and nurses also should communicate more with their clients regarding the consequences of noncompliance. Physicians and other healthcare professionals need to provide patients with simple and clear instructions so that patients can understand their treatment regimen. Nurses, pharmacists, and physicians may need to emphasize the need to take medications even when one is feeling well and explain the consequences of untreated illnesses such as hypertension. Healthcare professionals need to help persons who believe they are responsible for their health better understand how taking their medications correctly can have long term health benefits or affect their illness. Older African Americans will benefit from education strategies that focus on active learning and more patient participation in their health care.

For future research, there are several recommendations to improve this study. First, a larger sample size needs to be used. Second, patients could be tested to determine what their dominant health beliefs are and then a stratified sampling could be used after the locus of control measure is administered and equal numbers of persons with different belief orientations can be enrolled so meaningful comparisons can be made. Third, future research could examine noncompliance from a gender perspective and with old-old adults. Most of the participants in this study were female so gender comparisons would not have been meaningful. Fourth, spiritual beliefs and their impact on compliance could be explored. The participants in this study were members of a large metropolitan church so comparisons could be done with participants without religious affiliations. Last, more valid methods of eliciting and measuring compliance could be developed.

Summary Conclusion

The purpose of this study was to determine if health literacy and locus of control was associated with medication compliance in older African Americans. Data were collected from 30 participants of a large metropolitan church. The study findings suggest that formal education is not the best assessment for medication instruction comprehension. Although most participants were at the reading recognition level of high school, only half displayed good functional health literacy as measured by the TOFHLA. This finding is consistent with the literature as Safeer and Keenan (2005) argue that most adults read between eighth and ninth grade level yet most healthcare materials are written at a 10^{th} grade level or higher. Poor health literacy is such a current issue that the American Medical Association (AMA) is encouraging research on this issue and improving health literacy is one of the Healthy People 2010 goals (as cited in Safeer & Keenan, 2005).The researchers also noted that older adults have inadequate functional health literacy but they are more likely to have chronic and comorbid conditions. In the current study most participants reported chronic illness and according to Schillinger et al. (2002) these individuals are at the greatest risk for negative health outcomes. Additionally, the vast majority of the sample showed an internal locus of control orientation and consistent with past research, these individuals though scoring high on their health status, (positive correlations with health) were more noncompliant with their medication regimens. Consequently the research questions were answered, in that, poor health literacy and health locus of control appeared to influence medication compliance in older African Americans.

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Appendix A

Participant ID _____ Date _____

Demographic Questionnaire

For each question, please indicate your answer by putting a check mark in the boxes when appropriate, otherwise please write your answers in the appropriate boxes or on the lines:

1. Which of the following best describes you?

☐ African American

☐ African

☐ Black

☐ West Indian

☐ Bi/Multi racial

☐ Other (please specify)

2. Sex: ☐ Male ☐ Female

3. How old are you? _____

4. Years of school completed:

☐ Less than high school

☐ High school graduate

☐ Some college

☐ Technical school

☐ College graduate

☐ Post graduate

5. What is your income?

☐ < $10,000

☐ $10,000 - $14,999

☐ $15,000 - $24,999

☐ $25,000 - $34,999

☐ $35,000 - $54,999

☐ > $60,000

6. Past Medical History. (Check all that apply)

☐ High blood pressure

☐ History of stroke

☐ Diabetes

☐ History of heart disease

☐ History of cancer

☐ History of seizures

☐ Asthma

☐ Congestive heart failure

☐ History of glaucoma

☐ Chronic Obstructive Pulmonary Disease

☐ Kidney disease

☐ Other

7. How many over-the–counter (otc) drugs are you taking at the present time? _____

8. How often do you take the otc drugs? ☐ once a day ☐ more than once a day.

9. How many prescription drugs are you taking at the present time? _____

10. How often do you take the prescription drugs? _____

11. Date of last medical visit?_____

12. Type of doctor last seen? _____

13. How do you rate your general health on most days? (Check one)

☐ Poor

☐ Fair

☐ Good

☐ Very good

☐ Excellent

14. How do you rate your emotional health or sense of well-being on most days?

☐ Poor

☐ Fair

☐ Good

☐ Very good

☐ Excellent

15. How do you rate your quality of life on most days?

☐ Poor

☐ Fair

☐ Good

☐ Excellent

Appendix B. Institutional Review Board Approval Letter

INSTITUTIONAL REVIEW BOARD

Mail: P.O. Box 3999
Atlanta, Georgia 30302-3999

In Person: Alumni Hall
30 Courtland St, Suite 217

Phone: 404/463-0674
Fax: 404/654-5838

May 1, 2007

Principal Investigator: Clark, Patricia

Student PI: Karen Armstrong

Protocol Department: Gerontology Institute

Principal Investigator Department: B.F. Lewis School of Nursing

Protocol Title: The Relationship of Health Literacy and Locus of Control to Medication Compliance in Older African Americans.

Submission Type: Protocol H07422

Review Type: Expedited Review

Approval Date: April 30, 2007

Expiration Date: April 29, 2008

The Georgia State University Institutional Review Board (IRB) reviewed and approved the above referenced study and enclosed Informed Consent Document(s) in accordance with the Department of Health and Human Services. The approval period is listed above.

Federal regulations require researchers to follow specific procedures in a timely manner. For the protection of all concerned, the IRB calls your attention to the following obligations that you have as Principal Investigator of this study.

1. When the study is completed, a Study Closure Report must be submitted to the IRB.

2. For any research that is conducted beyond the one-year approval period, you must submit a Renewal Application 30 days prior to the approval period expiration. As a courtesy, an email reminder is sent to the Principal Investigator approximately two months prior to the expiration of the study. However, failure to receive an email reminder does not negate your responsibility to submit a Renewal Application. In addition, failure to return the Renewal Application by its due date must result in an automatic termination of this study. Reinstatement can only be granted following resubmission of the study to the IRB.

3. Any adverse event or problem occurring as a result of participation in this study must be reported immediately to the IRB using the Adverse Event Form.

4. Principal investigators are responsible for ensuring that informed consent is obtained and that no human subject will be involved in the research prior to obtaining informed consent. Ensure that each person giving consent is provided with a copy of the Informed Consent Form (ICF). The ICF used must be the one reviewed and approved by the IRB; the approval dates of the IRB review are stamped on each page of the ICF. Copy and use the stamped ICF for the coming year. Maintain a single copy of the approved ICF in your files for this study. However, a waiver to obtain informed consent may be granted by the IRB as outlined in 45CFR46.116(d).

All of the above referenced forms are available online at https://irbwise.gsu.edu. Please do not hesitate to contact Susan Vogtner in the Office of Research Integrity (404-463-0674) if you have any questions or concerns.

Sincerely,

Ann C. Kruger, IRB Chair