

HYPERTENSION KNOWLEDGE, EXPECTATION OF CARE, SOCIAL SUPPORT
AND ADHERENCE TO PRESCRIBED MEDICATIONS OF AFRICAN AMERICANS
WITH HYPERTENSION FRAMED BY THE ROY ADAPTATION MODEL

By

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Abstract

Hypertension Knowledge, Expectation of Care, Social Support and Adherence to Prescribed Medications

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Hypertension (HTN) prevalence in African Americans contribute to higher rates of disabilities and deaths from strokes, myocardial infarctions, and end stage renal diseases than all other racial groups in the United States. The major reason documented for these poor health outcomes is related to lower HTN control rates among African Americans compared to other racial/ethnic groups. Though overall HTN awareness, pharmacological treatments and control have significantly improved for all populations, studies found that rates of HTN control and adherence with antihypertensive medications are lower for African Americans compared to other subgroups.

Study Aims

The primary aim was to determine whether hypertension knowledge, expectation of care, and social support are predictors of adherence to prescribed medications while controlling for socioeconomic factors in the context of hypertension among African Americans.

Methods

A cross sectional quantitative approach was used. A secondary data analysis was conducted with 387 hypertensive African Americans. The Morisky Medication Adherence scale was used to measure adherence, internal consistency was established, ($r=.61$). The Roy Adaptation Model (RAM) was used to link HTN knowledge, expectations of care, social support, and socioeconomic factors with adherence to medications to provide an understanding of the process of adaptation. Logistic regressions were used to determine the relationships among the variables.

Results

The sample ($N=387$) was primarily female (76%) and men (24%). On average, participants scored high in knowledge about hypertension; mean knowledge score was .91 ($SD = .09$). Controlling for patient covariates, hypertension knowledge was not found to be a predictor of adherence to prescribed medications ($p=.469$). Expectation of care was found to be a predictor of adherence to prescribed medications ($p=.008$); social support was found to be a predictor of adherence to medications ($p=.006$).

Conclusion and Implications

This study supports findings regarding expectations of care, social support, and adherence to medication in African American patients with hypertension. The findings are useful for planning patient management initiatives specific to chronic disease such as hypertension.

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Chapter I

The Research Objective

Cardiovascular diseases are the leading cause of death in the United States (US), with hypertension (HTN) being the most common condition contributing to cardiovascular morbidity and mortality (Egan, Zhao & Axon, 2010; Gillespie, Kuklina, Briss, Blair & Hong, 2011; Gu, Dillion, Burt & Gilium, 2010; Wong, Shapiro, Boscardin & Ettner, 2002). Of these cardiovascular diseases, coronary heart disease accounts for 1 of every 6 deaths; stroke accounts for 1 of every 18 deaths; and heart failure accounts for 1 in every 8.6 deaths (Lloyd-Jones, Adams, Carnethon, Simone, Ferguson, Flegal, ..., Hong, 2009). Hypertension is the principal underlying cause of deaths and a complicating factor for heart and renal disease (CDC, 2012). However, with the growth of a large number of antihypertensive medications and steady improvements in hypertension detection and control in American adults, hypertension is a preventable cause for mortality (Jones & Hall, 2002; Egan, Zhao, & Axon, 2010). Hypertension is defined by the National Heart, Lung and Blood Institute, Seventh report of the Joint National Committee of Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (2003), as a systolic blood pressure of ≥ 140 millimeters of mercury (mmHg) or a diastolic blood pressure of ≥ 90 mmHg.

A population-based longitudinal study of approximately 20,000 men and women found that with controlled hypertension, systolic and diastolic pressures below ($<$) 140/90 mmHg (American Heart Association, 2009; Egan, et al., 2010; Farley, Dalal, Mostashri & Frieden, 2010), there was a lower risk for mortalities from cardiovascular disease (CVD) (Gudmundsson, Johannsson, Thorgeirsson, Sigfusson, Sigvaldason, & Witteman, 2005). Further, it was noted that systolic blood pressure was the best predictor of CVD mortality and all-cause mortality

(Gudmundsson, et al., 2005). It is therefore necessary to control systolic and diastolic pressures below (<)140/90 mmHg (American Heart Association, 2009; Egan, et al., 2010; Farley, et al., 2010; The Seventh Report of The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood pressure [JNC 7 (1) and JNC- VII (2)], 2003-2006).

Hypertension or high blood pressure (HBP) affects 1 in 3 (33%) Adults in the US an estimated 68million people (that is, systolic pressure >140mmHg and diastolic pressure >90mm Hg (CDC, 2011; Ostchega, Yoon, Hughes & Louis, 2006; CDC, 2011, National Center for Health Statistics [NCHS], 2010). Fifty percent of American adults with hypertension have control (CDC, 2011). For those under the age of 45, men are affected more than women, until age 65, women are more affected (CDC, 2011). Among African Americans, hypertension is particularly common, with the highest prevalence of 42.2 % compared to 31% in Caucasians and 25% in Mexican Americans (CDC, High Pressure Facts, 2011; Flack, Sic, Bakries, Brown, Ferdinand, Grimm... & Jamerson 2010).

Epidemiological studies found that African Americans (AA) developed HTN at younger ages, have higher rates of severe hypertension, i.e. blood pressure >180/110 mm Hg, and have higher prevalence of co-morbid diseases such as diabetes, and chronic kidney disease than other subpopulations (Flack, et al., 2010; Rosamond, Flegal, Furie, Go, Greenlund, Hasse,, Hong 2008). Individuals with blood pressure severities and co-morbidities have substantially higher rates of stroke and heart disease mortalities, as well as end-stage kidney disease, than the general population (Wong, Shapiro, Boscardin, & Ettner, 2002). When compared with Caucasians, African Americans have 420% greater rate of end stage kidney disease, 80% greater rate of fatal stroke and 30% more fatal strokes (Rosamond, et al., 2008). Research found that higher rates of strokes, and heart diseases were related to lower rates of hypertension control among African

Americans (Flack, et. al., 2010). Some lower rates of hypertension control have been related to poor adherence to medications, particularly for African Americans (Bosworth, Powers, Grubber, Thorpe, Olsen, Orr, & Oddone, 2008; Chobanian, Bakris, Black, Cushman, Green, Izzo . . . , Roccella, 2003).

Though overall pharmacological treatments and awareness of hypertension (HTN) have significantly improved for other sub-populations, studies found that rates of HTN control and adherence to antihypertensive medications were lower for African Americans compared to Caucasians (Angell, Garg, Gwynn, Bash, Thorpe & Frieden, 2008; Bosworth, Dudley, Olsen, Volis, Powers, Goldstein, & Oddone, 2006; Hyre, Krousel-Wood, Muntner, Kawasaki & DeSalvo, 2007). African Americans rates of adherence to antihypertensive medications are 66% compared to 85% in Caucasians (American Society of HTN and the National Heart, Lung and Blood institute, 2011). This study investigated patient related factors such as hypertension knowledge, expectations of care, social support, and their relations with socio demographics on adherence to prescribed medications (Bosworth, et al., 2006, IOM, 2004, Ogedegbe, Mancuso & Allegrante, 2004; DiMatteo, 2004).

Knowledge plays a major role in any health related decision making process (IOM, 2004). For instance, investigators found that in a population of 653 University staff and students, HTN knowledge positively influenced adherence behaviors (Getliffe, Crouch, Gage, Lake). In addition, a cross sectional study showed that Caucasians who were knowledgeable about elevated blood pressure and its relationship with decreased life expectancy were adherent with anti-hypertensive medication use and visiting their providers compared to those Caucasians who were less knowledgeable (Balazovjeh & Hnilica, 1993). Conversely, one study that investigated HTN knowledge and adherence to medications in both Caucasians and African Americans found

that even with HTN knowledge, African Americans still reported non-adherence compared to Caucasians (Bosworth, et al., 2008). Studies examining HTN knowledge in AA were inconsistent. For instance, individuals who reported a new HTN diagnosis had low HTN knowledge (Sanne, Muntner, Kawasaki, Hyre, & DeSalvo, 2008). Conversely, research conducted earlier found that even with duration of 14 years of HTN diagnosis, individuals of an urban population lacked comprehensive HTN knowledge (Olivera, Chen, McCarthy, Davis, & Hill, 2005). Since HTN knowledge was not measured with a standardized instrument, findings were limited (Olivera, et al, 2005).

Expectation of care is defined as patients' thoughts of what they will receive, whether desired or not and the overt communication of those thoughts (Uhlman, Inui, & Carte, 1984). Studies showed that eliciting patients' expectation of their care provided healthcare providers with enhanced understanding of related issues pertaining to the clinical problem being addressed (Kravitz, Cope, Bhrany & Leake, 1994; Lazre, Eisenthal & Frank, 1989). In addition, expectation of care was shown to improve patients' active role in their relationships with providers, invigorate negotiations with their care, and promote adherence (Lazre, et. al., 1989). A qualitative study found that hypertensive African Americans expected to take an active role in their hypertension care (Ogedegbe, et al., 2004). Since there has been limited studies examining expectation of care in AA populations, additional studies are needed to investigate expectation of care and medication adherence (Ogedegbe, e al., 2004).

Lastly, social support is considered a predictor of adherence in that family and friends let people with HTN know that they care about them and remind them to adhere to medications to prevent further problems (Ogedegbe, Harrison, Robbins, Mancuso, & Allegrante, 2004). The investigator of a meta-analysis of 122 existing studies concluded that there was a strong overall

positive correlation between social support and adherence to medical treatments among medical patients with various diseases and conditions (DiMatteo, 2004). However, other studies examining hypertension among African Americans suggested that the association between social support and adherence may vary with gender (Bosworth, et al, 2006; Braverman & Dedier, 2009). Further investigation of social support and adherence to medications in AA is warranted because findings from previous studies were inconclusive, scant, and varied according to gender.

This study was a secondary data analysis of a large interventional study, the Counseling African Americans to Control Hypertension (CAATCH) study. This present study examined the relationships of HTN knowledge, expectation of care, social support, and adherence to prescribed medications of African Americans who received care in 30 community health centers. The CAATCH study randomized participants to the intervention condition group or the control group, who received usual care according to uncontrolled blood pressure (Ogedegbe, Tobin, Fernandez, Gerin, Diaz-Gloster, Cassells ... & Ravenell, 2009). The purpose of the CAATCH study was to evaluate the effectiveness of a multifaceted, evidence-based intervention compared with usual care for improving blood pressure control in African Americans.

The Problem Statement: What are the relationships of HTN knowledge, expectation of care, social support, and adherence to prescribed medications in African Americans?

Definitions

The terms listed below are conceptual and operational definitions for this study.

Adherence to Prescribed Medications

Adherence is used interchangeably with the term compliance. Compliance is “the extent to which a person’s behavior (terms of medication, following diets, or executing lifestyle changes) coincides with medical or health advice” (Haynes, 1979, pp.2-3). This term connotes a

paternalistic view where patients play a passive, unequal role in the patient- provider relationship. Therefore, the more modern term adherence is defined as the participation of patients in an active, voluntary and collaborative role with mutually acceptable behavior for patient and provider in order to produce a therapeutic result (Meichenbaum & Turk, 1987). Adherence was measured by the Morisky medication adherence questionnaire. The World Health Organization (WHO) has similar definition for adherence (Sabbate, et al., 2003, p.3).

African American or Black

This is a person having origins in any of the black or African ancestry. It includes people who indicate their race as “black, African American, or Negro” or provide written entries such as African American, Afro American, Kenyan, Nigerian, or Haitian (US Census Bureau, 2010). For this study, those individuals who self-identified as Black or African Americans were included.

Expectations of Care

Expectations are what patients think that they will receive, this is whether it is desired or not, requests are desires that are verbalized to the provider and the term explicit expectations are openly communicated (Uhlman, et al., 1984). Patients’ expectations are based on their beliefs regarding their condition and the perceptions of symptoms and vulnerability (Shaw, Anderson, Maloney, Jay, & Fagan, 1995). This variable will be measured using the Blood Pressure Outcome Expectation Questionnaire.

Hypertension Knowledge

Hypertension knowledge is the awareness that blood pressure is above documented parameters for HTN, awareness of systolic and diastolic BP values and the meaning. HTN knowledge will be operationalized by scores obtained from the hypertension knowledge

questionnaire used in the CAATCH study. This questionnaire was developed by the National Heart Lung Blood Institute (Carter-Edwards, Jackson, Runaldue & Svetkey, 2002).

Social Support

The aspect of social support that will be the focus of this study is functional support. Functional support is when interpersonal relationships aids in certain functions, i.e. emotional support, caring, empathy; instrumental support, informational guidance, and social companionship (Cohen & Syme, 1985; Sherbourne & Stewart, 1991). This concept was measured using the Medical Outcomes Study (MOS) survey (Sherbourne & Stewart, 1991).

Delimitations

A data set was used, which predetermined the data collection, the quality of these data, the available variable instruments, and how the data were collected. This study included participants who were receiving care from community health centers (CHCs) in the New York City Metropolitan area for at least 6 months during the years 2004-2011. This study excluded patients who were non English speaking. The population included patients who self-identified as Black or African Americans. The sample size for the parent study was 1059 participants.

Conceptual Framework

The conceptual framework that guided this study was the Roy adaptation model (RAM) (Roy, 2009; Roy & Andrews, 1999; Roy & Roberts, 1981). This nursing model describes people as adaptive systems that are in constant interaction within changing environments (Roy & Andrews, 1999). The point of interaction between the person's system and the environment is classified as a stimulus, which could originate from internal or external environment. There are three stimuli, the focal, contextual, and residual. The focal stimuli are the immediate internal or external stimuli that the person is aware of. The contextual stimuli are all other stimuli that

affect the focal stimuli and directly relate to how people deal with the focal stimuli. For this study, HTN knowledge, expectation of care and social support represent the focal stimuli. Hypertension knowledge was measured by the HTN knowledge questionnaire (Carter-Edwards, Jackson, Runaldue & Svetkey, 2002), expectation of care was measured by Blood Pressure Outcome Expectation Questionnaire (Ogedegbe, et. al., 2009) and social support was measured by the MOS survey (Cohen & Syme, 1985; House and Kahn, 1985, & Sherbourne & Stewart, 1991). The contextual stimuli were age, gender, marital status, nativity status, education, employment status, income, and insurance. This socio-demographic information was captured on the demographic data sheet.

The RAM postulates that humans respond to stimuli through coping processes, the regulator subsystem, and the cognator subsystem. The regulator activates the senses and in turn, stimulates the nervous, circulatory, endocrine systems of the body. The cognator subsystem responds through the four cognitive-emotional channels; the perceptual and information processing, learning, judgment, and emotion (Roy, 2009). In this present study the subsystems were not represented. The decision not to include the cognator or regulator was made based on Roy's proposition, which asserted that the characteristics of the internal and external stimuli are directly associated with behavioral responses. For instance, the internal and external stimuli included HTN knowledge, expectation of care, social support, age, gender, marital status, education, employment status, income, and insurance, influence individuals' behavior, as manifested in one of the adaptation mode, which is the role function mode. Therefore, hypertensive individuals, who assume the sick role either, execute the behavior of adherence to taking antihypertensive medications or not (Fawcett, et al., 2011). The Roy Model postulates that behavioral responses are observed in four modes of adaptation (Roy & Andrews, 1999).

The four adaptive modes, the physiologic mode, self-concept mode, role function mode, and interdependence mode are output of the human system, which manifest as adaptive or ineffective responses (Roy, 2009). Each response serves as feedback to the human system, helping the person to increase or decrease the effort to cope with the stimuli. The physiological mode manifests the physical response to the environmental stimuli. The self-concept mode is a reflection of composite of beliefs and feelings that people hold about themselves. The interdependence mode demonstrates individuals' feelings of security through nurturing and supportive relationships. The role function mode focuses on societal roles of individuals with the basic need being social integrity. Social integrity is defined as the need to know oneself in relations to other individuals in order to act appropriately (Roy & Andrews, 1999). Individuals have three roles, the primary, secondary and tertiary, which are associated with certain behaviors. The goal of the behavior is to meet societal expectations (BBARNS, 1999). For this study, the behavior is adhering to anti-hypertensive medication, which is expected. In doing so, individuals will demonstrate role mastery. The mode of adaptation represented was the role function, which depicted adherence to prescribed medications.

The Roy Adaptation Model (RAM) was selected to guide this study for three reasons. First, adherence requires a holistic approach to fully understand behavioral adaptation. Second, the RAM describes people as holistic adaptive systems that respond to a variety of stimuli. Third, each variable proposed the relationship between stimuli and the impact on behavior as reflective in the behavioral modes (Andrews & Roy, 1986; Riehl & Roy, 1974; Roy, 2009; Roy & Andrews, 1999; Whittemore & Roy, 2002). The goal of nursing is the promotion of adaptation in each mode. Nursing aims to enhance personal and environmental transformation. The RAM

postulates that nursing would intervene to increase adherence to medications and thus improve high blood pressure (data on monitored blood pressure is not used in this dissertation study).

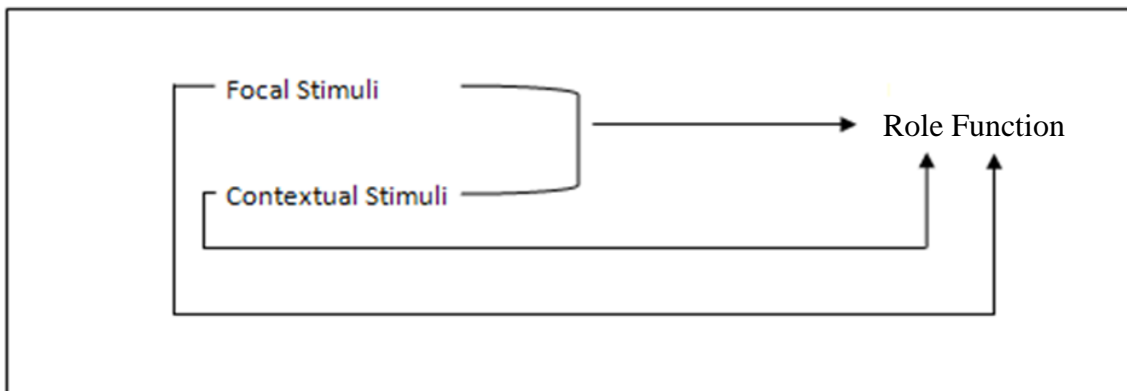


Figure 1. Roy adaptation model proposition illustrated

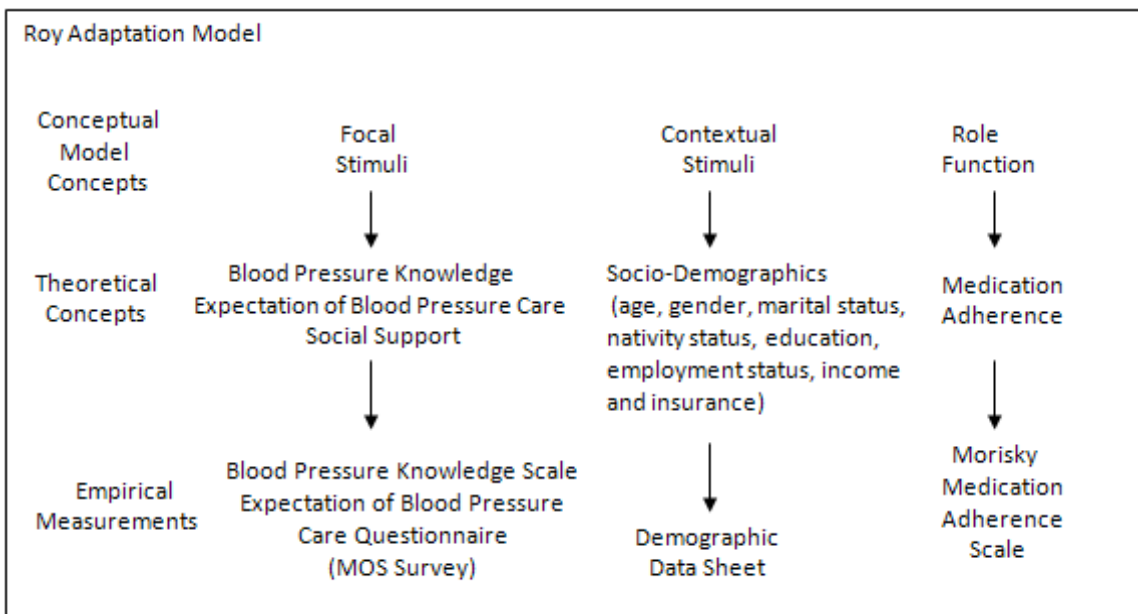


Figure 2. Conceptual Theoretical-Empirical diagram for hypertension knowledge. Expectation of care and Social support on adherence to prescribed medications.

Research Aims /Hypotheses

The research aims and hypotheses for this study of patients with HTN are as follows:

Aim 1

To examine the association between HTN knowledge and adherence to prescribed medications before and after controlling for age, gender, marital status, nativity status, education, employment status, income, and insurance status.

H1: HTN knowledge is associated with positive adherence to prescribed medications before and after controlling for age, gender, marital status, nativity status, education, employment status, income, and insurance status.

Aim 2

To examine the association between expectation of care and adherence to prescribed medications before and after controlling for age, gender, marital status, nativity status, education, employment status, income, and insurance status.

H2 : Expectations of care is associated with positive adherence to prescribed medications before and after controlling for age, gender, marital status, nativity status, education, employment status, income, and insurance status.

Aim 3

To examine the association between social support and adherence to prescribed medications, before and after controlling for age, gender, marital status, nativity status, education, employment status, income and insurance status.

H3: Social support is positively associated with adherence to prescribed medications before and after controlling for age, gender, marital status, nativity status, education, employment status, income, and insurance status.

Aim 4

To examine whether the associations examined in Aims 1, and 3 vary with age, gender, and education.

H4 a: The association between hypertension knowledge and adherence to prescribed medications is stronger among those younger than 60 years old, female, and highly educated than among their counterparts aged 60 years and older, male, and less educated.

H4b. The association between social support and adherence to prescribed medications is stronger among those older than 45 years, men and highly educated than among their counterparts aged 45 years and younger, with less education.

Aim 5

To examine the associations among the focal stimuli, HTN knowledge, expectation of care, and social support, and contextual stimuli, age, gender, marital status, nativity status, education, employment status, income, and insurance influence adaptation, adherence to medication (the Roy Adaptation Model Proposition).

H5. The association among HTN knowledge, expectation of care, social support, age, gender, marital status, nativity status, education, employment status, income, and insurance positively influenced adherence to prescribed medications.

Study Significance

This study is needed for three reasons; (a) to advance knowledge of adherence behaviors in a high risk population of hypertensive patients, African Americans; (b) understand adherence from patients' perspectives; and (c) contribute to the body of knowledge in nursing science. The National Council on Patient Information and Education (NCPIE, 2007) documented that Americans have inadequate knowledge about the importance of adherence behaviors as a critical

component of improved health. In spite of three decades of debates and discussions on the issue of poor adherence, there has not been enough sustained intervention (NCPIE, 2007). This issue of poor adherence and inadequate sustained involvement in hypertensive individuals is steadily worse for African Americans, and contribute to the health disparity gap among Caucasians and African. Change in adherence behaviors requires diverse strategies for different people. This study investigated African American and the influence of patient related factors on adherence to anti-hypertensive medications. Knowledge obtained from this study can offer targeted intervention and diverse strategies for adherence behaviors in high risk populations.

The Center for Disease Control (2010) recommended when exploring factors that influence HTN control in African Americans, research should focus on patients' perceptions about HTN. This study responded to the national call for more scientific evidence to better understand patient's perspectives or expectations when evaluating adherence, especially for minority populations (Leventhal et al., 2003; Ogedegbe, et al., 2004). For decades patients' adherence was viewed from the perspective of health professionals instead of the perspective of patients (Morris & Schulz, 1992; Vermeire, Vermeire, Hearnshaw, Royen, & Denekens, 2001). Individuals construct their own views of their illnesses and its' treatments but, often times, these views differ from those of their health care providers. Because of conflicting views between individuals and their providers, it is necessary to understand individuals' expectations of their illness and interventions (Ogedegbe, et. al., 2004). This study investigated how expectation of care influences adherence to medications and thus, helped to advance knowledge of HTN among African Americans and their adherence or adaptive behaviors. The knowledge generated additional evidence for nurses and other health care providers to help African Americans achieve HTN control.

This study contributed to the body of knowledge of nursing science by advancing the understanding of health promotion behaviors in African Americans through the perspective of the RAM. Such health promoting behavior include adherence to medications, which reflected the process of adaptation. Nursing is a health care profession that focuses on human life processes to promote and protect health for individuals, families and communities (Roy & Andrews, 1999). The goal of nurse professionals is to promote adaptive abilities through effective coping mechanisms and enhance person and environmental transformation (Alligood & Tomey, 2010). This study examined social support as environmental stimuli of interest and its association with adherence. Social support is defined as an interaction of two or more people whose goal is to promote awareness and knowledge and provide emotional support with problem solving (Moser & Worster, 2000 ; Samarel, Tulman, & Fawcett, 2002). In examining adherence from the perspective that humans are adaptive beings with modes of responses that manifest through social, psychological and emotional indicators provided further understanding about African Americans abilities to adapt.

Roy stated that “health is not freedom from the inevitability of death, disease, unhappiness, and stress, but the ability to cope with them in a competent way” (Roy Andrews, 1999, p.52). Adhering to prescribed medication reflected effective adaptation. Health and illness together is inevitable and coexistent dimension of persons total life experience (Riehl & Roy, 1974). Understanding this dimension is a major goal for nursing. Very few published studies used the RAM to examine the concept of adherence to prescribed medications (BBARNS, 1999).

Summary

Chapter I outlined the problem of poor adherence to medications in African Americans and established the importance of this public health issue. Adherence to prescribed medications has particular relevance to hypertensive individuals because of the crucial role of HTN control in preventing cardiovascular morbidity and mortalities.

This study focused on the associations among HTN knowledge, expectation of care, social support, and socio-demographics on adherence to prescribed medications in hypertensive African Americans. The conceptual design used to guide this study was adapted from the Roy Adaptation Model (1984). This model depicted a holistic adaptive system wherein the independent variables, HTN knowledge, social support, and expectations of care represented the focal stimuli and the socio-demographics such as age, gender, marital status, nativity status, education, employment status, income, and insurance represented the contextual stimuli. There are no published studies found that examined the associations between HTN knowledge, expectation of care and social support in the hypertensive African American patient population.

Chapter II

Literature Review

This chapter consists of several essential components of the current study. First, an overview of hypertension and its significance as a health problem are presented, including the diagnosis and classification of blood pressure. Second, patient and provider factors related to Non- Adherence. Third, research is described that examined adherence to prescribed medication, including methods for measuring adherence, prevalence of non-adherence in the general population and in African Americans. Fourth, a review of what is known about the relations of hypertension knowledge, expectations of care, social support, on adherence to medication are presented. Fifth, pertinent research that used the Roy Adaptation Model to show psychosocial adaptation is presented. Finally, this chapter concludes with a summary of the gaps in research findings.

Overview of Hypertension and its Importance as a Health Issue

Hypertension is an important health issue because it is related to numerous adverse consequences that contribute to morbidities and mortalities in the general population, particularly in African Americans (Flack, et al., 2010). HTN- related complications such as stroke, chronic kidney disease and end stage renal disease, left ventricular hypertrophy, and heart failure occur disproportionately in African Americans compared to whites (Lloyd, Adams, Carmethon, Simone, Ferguson, Flegal,...Hong,Y.,2010; Mensah, Mokdad, Ford, Greenlund, & Croft, 2005). In 2005, HTN death rate in African Americans (per 100, 000 population) compared to whites was 51.0 in men, 15.1 in Caucasian men, respectively, and 40.9 in women, 15.1 in Caucasian women, respectively (CDC, 2008). These negative health disparities warrant any efforts to control of high blood pressure in African Americans.

The International Society on Hypertension in Blacks (ISHIB), who has been pioneering management of HTN in blacks strongly encourages health care practitioners to treat blacks with antihypertensive medications on an individualized basis rather than treating with preferred medications for blacks (Flack, et al., 2010). Furthermore, one of the goals of the Committee on Leading Health Indicators for Healthy People 2020 is to reduce the number of persons with HTN (IOM, 2011). The reduction of HTN in African Americans could lead to the accomplishment of one of the overarching goals of Healthy People, 2020, of decreasing health disparities (IOM, 2011).

Over the past 2 decades, hypertension awareness increased among Americans, e.g., 81.8% in non-Hispanic African American women, 73.4% in Non-Hispanic white women, 67.8 % in non-Hispanic African American men, and 70.4% in non-Hispanic white men. Treatment rates were higher in non-Hispanic African American women, 71.7%, compared to non-Hispanic white women, 64%. On the other hand for non-Hispanic African American men treatment rates were 56.5% compared to 60% in non-Hispanic white men. Even with improved HTN awareness and treatments, blood pressure control remains inadequate in the majority of hypertensive men and women. Control rates for non-Hispanic African American women 29.9%, compared to non-Hispanic white women 34.5%; non-Hispanic African American men 29.9%, for non-Hispanic Caucasian men 39.3%. Among hypertensive African American treated with medications, HTN control remains low at 45% (Giles, Aranda, Suh, Choi, Preblich, Rocha, & Frech-Tamas, 2007).

Diagnosis of Hypertension

Hypertension or high blood pressure is defined by the National Heart, Lung and Blood Institute, Seventh report of the Joint National Committee of Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (2003), as a systolic blood pressure of ≥ 140 millimeters

of mercury (mmHg) or a diastolic blood pressure of ≥ 90 mmHg. HTN is classified based on the average of two or more adequately measured blood pressures while seated on each of two or more office visits. Table 1 shows the classification of blood pressure for adults. For this study blood pressure monitoring was not conducted. HTN could be stage 1 and or 2. However, those terms were not used in this study.

Table 1 Classification of Blood Pressure for Adults

Blood Pressure Classification	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Normal	<120	And <80
Pre-hypertension	120-139	Or 80-89
Stage 1 hypertension	140-159	Or 90-99
Stage 2 hypertension	≥ 160	Or ≥ 100

Note. From the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (2003).

Several studies found that poor blood pressure control in African Americans was related to a variety of factors, i.e. increased anxiety about blood pressure, increased stress levels, adverse side effects of anti-hypertensive medications, older age, and self-report of non-adherence (Bosworth, et al., 2006; 2008; CDC, 2008; Roberts, Vines, Kaufman, & James, 2008). A cross sectional study examining frequency of racial and nonracial discrimination and HTN in 1,100 middle aged African Americans, found that the type and frequency of discrimination perceived

affect the risk of HTN (Roberts, et al., 2008). In another cross sectional study examining potential explanatory factors for racial differences in blood pressure control among 306 African Americans in the Veteran Affairs found that being older, having high levels of stress, being worried about HTN, and reporting HTN medication non-adherence, were related to poor blood pressure control (Bosworth, et al., 2008).

Patient and Provider Related Factors to Non-Adherence

Studies found that patient and provider- related factors negatively influenced adherence to medications (Casagrande, Gary, Laveist, Gaskin, & Cooper, 2007; Cooper, Rote, Johnson, Ford, Steinwachs, Powe, 2003; Ogedegbe, et al, 2004; Paez, Allen, Beach, Carson, & Cooper, 2009). In a qualitative study with 93 hypertensive African Americans who had open-ended interviews during their clinic visits, it was found that 23% thought anti-hypertensive medications only needed to be taken with symptoms, 38% believed that HTN could be cured, and 38% believed that taking ant-hypertensive medications for a life time was not necessary (Ogedegbe, et al., 2004). These beliefs could negatively impact medication adherence of African Americans who are prescribed hypertensive medications for long term; additionally, these beliefs could prevent these individuals from seeking treatment.

Mistrust of the health system among African Americans is a contributing factor to non-adherence. In a study examining perceived discrimination, delays in seeking medical care, and adherence to medical care recommendations among African Americans and whites living in a socioeconomically homogenous and racially integrated community, African Americans who reported more life time episodes of discrimination compared to those who did not report such occurrence, delayed seeking medical care and had poor adherence with medical recommendations (Casagrande, et al., 2007). A cohort study of 142 African Americans and 110

Caucasians showed that Race-concordant clinic visits (both patient and provider of the same race) were longer, had higher ratings of positive patient affect, and were rated as more participatory and more satisfying to these patients (Cooper, et al., 2003). A study examined the association of patients' ratings of the patient-physician relationship with physicians' self-reported cultural competence in African Americans and whites (Paez, et al., 2009). Researchers found that patients who were managed by physicians who reported increased motivation to learn about other cultures and increased cultural competence behaviors were more satisfied with their visits and viewed their physician as being more facilitative, thus they sought and shared more information with their physician. These aforementioned factors could undermine the delivery of effective health care of African Americans and impact adherence to treatment (Flack, et al., 2010).

Adherence to Prescribed Medications

According to WHO, adherence is “the extent to which a person’s behavior, such as taking medication or following a diet, and/or executing lifestyle changes-corresponds with agreed recommendations from a health care provider” (Sabbate, et al., 2003, p.3). Previous studies of adherence to cardiac medications recommended that the desired effect of treatment would be reached if individuals take 80% of the prescribed medication (Haynes, et al., 1979). Achieving this medication adherence goal has resulted in positive health outcomes. For instance, a majority of studies found that adherence with medications was positively related with clinical outcomes of blood pressure control and decrease in cardiac mortalities (Corrao, Parodi, Nicotra, Zambon, Merlino, Cesana, & Mancia, 2011; Cramer, et. al., 2008; Fernandez, Scales, Pineira, Schoenthaler, & Ogedegbe, 2008). However, inadequate rates of adherence have been a major challenge for treatment outcomes, especially for patients with chronic diseases, such as

hypertension (Chobanian, Bakris, Black, Cushman, Green, Izzo,.... & Roccella 2003; Hawkshead & Krousel-Wood, 2007; Krousel-Wood, Muntner, & Morisky, 2005). In other words, non-adherence to medications lead to increased cardiovascular hospitalizations, frequent emergency visits, and increased mortalities (Rasmussen, Chong, & Alter, 2007). This is particularly concerning for health care providers, health care systems, and stakeholders (McDonnell & Jacobs, 2002; Osterberg & Blaschke, 2005; Schiff, Fung, Speroff, & McNutt, 2003). With the U.S population growing older and the number of people with chronic diseases increasing, patients will be required to take more medications (Gurwitz, Field, Harrold, Rothschild, Debellis, Seger, ..., Bates, 2003). Furthermore, it is increasingly required to use performance measures that reward good healthcare outcomes such as blood pressure control, thus methods of measurement for adherence to prescribed medications are important for clinical practice.

Measurements of Adherence

Several methods for measuring medication adherence have been used (Baroletti & Orfano, 2010; Dimatteo, 2004; Gossec, Tubach, Dougados, & Ravaud, 2007; Ho, Bryson & Rumsfeld, 2009; Vermeire, et al., 2001). These adherence measures are direct or indirect, i.e.,

- a). Direct measurement detects chemical through a metabolite or a marker in the urine or blood,
- b). Direct observation provides information when administering therapy. Indirect measures include: self report through personal interviews, documenting in diaries, pill counting, pharmacy monitoring of refilling or dispensing medications, medication event monitoring systems(MEMS)and collateral reporting of family members.

Self-Report Adherence Measures

A self-report adherence scale that is frequently used is the Morisky adherence scale. The Morisky scale is a validated 4- item self-reported adherence measure. Research showed the Morisky scale is predictive of adherence to cardiovascular medications and blood pressure control (Morisky, et al., 1986; Shalansky, Levy, & Ignaszewski, 2004). A study found there was a significant relationship between self-report of medication non-adherence and adverse cardiac events such as stroke heart attack, and death (Gehi, Ali, Na, & Whooley, 2007).

Self-report of adherence is common and easily accessible to use in clinical settings. It allows for the assessment of initial adherence information which would not be retrievable with other methods of measurement. However, research suggest that self-report adherence measures can be biased through social desirability, where patients report an overestimation of their adherence or an inexact recall to their health care providers (Cook, Wade, Martin, & Perri, 2005; Gossec, et al., 2007).

Prescription Refill System and Medical Event Monitoring System

Prescription refills provide information about patients refilling their prescriptions within a closed system such as the Veterans Affairs Health Care system. In this system, one can track if the medication was filled. However, the limitation to such system is that there is no way to know if patients actually took their medications or not (U.S. Department of Veterans Affairs, 2013).

The Medical Event Monitoring System (MEMS) is considered the gold standard for evaluating adherence to medication (Urquhart, 1997; Lee, Kusek, Greene, Bernhard, Norris, Smith, ..., & Wright, 1996). It is an electronic monitoring device that uses a standard pill container and is connected to a microprocessor, which records the date and time when the bottle was opened. Studies have shown that the MEMS provide an objective and practical manner in

which to assess adherence patterns (Lee, et. al., 1996; Ogedegbe, Schoenthaler, Richardson, Lewis, Belue, Eugenia, . . . , Charleston, 2006; Urquhart, 1997).

In the African American Study of Kidney Disease and Hypertension Pilot Study (AASK), the MEMS and pill count were used to measure medication adherence in 92 black participants (Lee, et. al., 1996). Findings showed 36 % of the participants were classified adherent by both the MEMS and pill count with once per day dosing. With the pill count, there was 68% of the follow up visit adherent and with the MEMS, there was 47% non-adherent. Blood pressure was controlled with 50% of the participants who used both the pill count and MEMS throughout their follow up visits. Researchers suggested that the use of the MEMS is a useful adjunct to pill counts in assessing adherence to anti-hypertensive medications.

Although the Medication electronic monitoring is the gold standard for objectively evaluating adherence, there are some limitations to the MEMS. Limitations include: inability to know if the pill was ingested when the bottle was opened or if the correct dose was taken by the patient. Research suggests that using two methods of monitoring adherence would be more reliable (DiMatteo, 2004)

Prevalence of Non-Adherence

Adherence among hypertensive populations is poor, which contributes to low rates of HTN control (Burnier, 2006; Waeber, Burnier, & Brunner, 1999). In a longitudinal study from 1989 to 2006, 4783 patients diagnosed with hypertension were prescribed antihypertensive medications once per day (Vrijens, Vincze, Kristanto, Urquhart, & Burnier, 2008). Their dosing history was electronically documented by a medication event monitor. Each time the medication container was opened; the date and time were recorded. Dosing was from 30-330 days and involved 43 different anti-hypertensive medications. Results showed, about half of the patients

who were prescribed an antihypertensive medication stopped taking it within one year. In addition, on any given day, these patients omitted about 10% of their scheduled doses. In these subsamples the mean age was 59 years old, 58% were men, which were similar to reported values (Hyman & Pavik, 2001).

A majority of studies found that adherence with medications is positively related with the clinical outcomes of blood pressure control and decrease in cardiac mortalities (Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial, 2002; Corrao, et al., 2011; Cramer, Benedict, Muszbek, Keskinaslan, & Khan, 2008; Fernandez, Scales, Pineira, Schoenthaler, & Ogedegbe, 2008). However, inadequate rates of adherence have been a major challenge for treatment outcomes, especially for patients with chronic diseases, such as hypertension (Chobanian, et.al., 2003; Hawkshead & Krousel-Wood, 2007; Krousel-Wood, Muntner, & Morisky, 2005). Previous studies investigating adherence to cardiac medications recommended that the desired effect of treatment would be reached if individuals take 80% of the prescribed medication (Haynes, et al., 1979). This section of the review focused on pertinent studies of adherence to medication among individuals with HTN, relationships among HTN knowledge, expectations of care, and social support.

In a review of 76 studies from 1986 to 2000, Claxton, Cramer, & Pierce (2001) described conclusions from these studies regarding medication dose frequency and adherence to medication. Adherence was found to range from 34% - 97% and as the number of medication daily doses increased, adherence decreased significantly (1dose=79%, \pm 14%, 2 doses=69% \pm 15%, 3 doses= 65% \pm 16%, 4 doses= 51% \pm 20%, $P < 0.001$) for medication dose schedules. The majority of these studies reported that electronic monitoring bottle caps were used to monitor adherence (Claxton, et al., 2001). Fourteen of the studies investigated individuals' abilities to

take doses within the prescribed time frame. Results showed the average overall dose-timing compliance rate was $59\% \pm 24\%$. One time dose daily medication regimens were more appropriate for individuals than other regimens requiring several doses. Of those studies that used electronic monitoring devices, the results were that individuals took 50% to 79% of their daily doses of medications as prescribed across a wide range of therapeutic goals. Findings from these studies were consistent with previous studies, especially in the context of chronic diseases such as hypertension and hypercholesterolemia, i.e., non adherence related to worse medical treatment outcomes. Non adherence to antihypertensive medications have been particularly challenging for African Americans, who have been known to be less adherent to prescribed medications as compared to white counterparts (Charles, Good, Hanusa, Chang, & Whittle, 2003; Bosworth, et al, 2008).

In 2005 data from a Health Styles survey consisting of 1432 participants who received antihypertensive medications reported that common barriers to adherence to antihypertensive medication included: forgetfulness, cost of medication, lack of health insurance, side effects, perception of no need for treatment, and having no primary care provider (Vawter, Tong, Gemilyan, & Yoon, 2008). A multivariate model showed that younger age, lower income, and having blood pressure checked 6 months earlier were significantly associated with reporting difficulty in taking prescribed antihypertensive medications. Although Blacks and Hispanics reported more barriers to taking medications than Whites, after adjusting for other demographics, behavioral factors, & health status, race had no significance ($p=.16$). Some strengths and limitation of this study include a population based design. However, there was no random sampling. In addition, there was a low response rate of 49%, which may account for non-response bias. Also, because a patient questionnaire was used to assess adherence, there may

have been recall bias or overestimating of adherence. Contrary to the aforementioned study, a retrospective cohort study found that older African Americans with hypertension had lower adherence rates for a number of antihypertensive medications compared to whites (Poon, Lal, Ford, & Braun, 2009).

A randomized controlled interventional trial with a group of 569 Veterans with 41% African Americans was conducted to explore factors that may explain racial differences in adherence to antihypertensive medication and factors to explain racial differences in blood pressure control (Bosworth, et. al., 2006). Self-reported adherence was assessed by the Morisky scale; reliability or validity information was not provided. However, for the Morisky scale sensitivity (72%) and specificity (74%) were as noted from a prior study. To investigate HTN knowledge and perceived risks, the modified HTN beliefs questionnaire was used and the Rapid Estimate of Adult Literacy in Medicine (REALM) was used to measure health-related literacy. High criterion related validity was reported for the REALM instrument. Results of a logistic regression analysis showed that African Americans were more likely to have inadequate blood pressure control compared to whites (63% vs. 50%; $P < .003$; OR=1.70; 95% CI 1.20-2.41). African Americans had a higher odds of being non adherent with their medications (OR=1.81; 95% CI 1.28-2.58), were more functionally illiterate, and had a family member with HTN compared with whites. In addition, African Americans were more likely to perceive high blood pressure as very serious versus serious (OR=1.75; 95% CI 1.16-2.63), and reported increased urination (OR=1.98; 95% CI 1.39-2.82) compared to Whites. These findings are similar to prior studies that found that African Americans reported poorer medication adherence compared to Whites (Hyman & Pavlik, 2001; Psalty, Manolio, Smith, Heckbert, Gottdiener, Burke, 2002).

In a randomized control trial of 337 urban African American adults, data from a sample of 70 participants were selected to assess the relationship of antihypertensive medication adherence to socio-demographic, clinical and cognitive characteristics (Braverman & Dedier, 2009). Medication adherence was measured with the medication event monitoring system caps (MEMS). Analysis showed that overall mean prescribed doses taken per day and the mean percentage of days taken as prescribed were highly correlated ($r=.94$, $P<.001$); There was a significant correlation with systolic blood pressure ($r=.253$, $P<.04$) and self-reported medication adherence ($r=.285$, $P<.03$); $N=$ no significant difference in adherence was found between men and women; however, for education and sex there were strong interactions, i.e., females with less than high school education were less adherent (61%) than females with more formal education (74%); On the other hand, for males, those with lower education were more adherent than those with higher education (91% vs. 72%, respectively; $F [1,47]=4.244$; $P<.05$). The interaction between sex and whether or not the individual lived alone was significant ($F [1, 66] =3.38$, $P<.08$). Females who lived alone had higher adherence (74%) than females who lived with someone else (65%). In contrast, males who live alone were less adherent (69%) and males who lived with someone else were more adherent (86%). In comparing other studies of adherence to medication, in this study adherence was assessed with using MEMS technology which is considered an objective tool for adherence. Other interacting factors reported in this study include education and adherence to medications by sex. Explanation for less educated female to adhere less than more educated female is that lower educated women are preoccupied with family matters (Braverman, et al., 2009). Researchers suggested that caring for dependents was related to lower adherence to medication (Hyre, Krousel-Wood, Muntner, Kawasaki, DeSalvo, 2007). With such inconsistency with gender, social support, and adherence to medication among

African Americans, further investigation was needed. In examining whether social support impacts adherence differently in men and women, results may provide implications to hypertension research and HTN clinical practice.

An Integrated data analysis study explored adherence related factors from 2002-2003 (Siegel, Lopez, & Meier, 2007). These factors included medication class, number of medications, demographic factors including age and ethnicity, and the diagnosis of diabetes and depression (Siegel, et al., 2007). Data of 40,492 hypertensive individuals from six Veteran Affairs facilities in Northern California were selected and reviewed during 2002-2003. A pharmacy database that showed dispensed medications was used for the study. Profiles of individuals who were actively taking at least one medication in any of the 6 categories of anti-hypertensive medications were reviewed. To be classified as adherent, individuals needed a score of 80 % or greater. The results were that unadjusted adherence rates compared to medication class, 78.3% for thiazide diuretic to 83.6% for angiotensin receptor blockers ($P < .001$).

Similarly, in a cross sectional study of the ongoing Counseling African Americans to Control Hypertension (CAATCH) randomized trial, patient, provider and health care systems factors were assessed in relationship to medication adherence among black men with hypertension (Lewis, Schoenthaler, & Ogedegbe, 2012). Results found that over one half of the participants (54.9) were non-adherent with taking medication. In addition, age, self-efficacy, and depression were predictors of medication adherence.

Hypertension Knowledge

Hypertension Knowledge has increased over the last 3 decades (Ostchega, Yoon, Hughes, & Louis, 2008). In the late 1970's, 50% of the US adults were unaware that they had hypertension, 70 % were not being treated and 10 % had their blood pressure controlled (Moser, Franklin, & Handler, 2007; Department of Health and Human Services, National Heart, Lung, and Blood Institute, 2007). Today more than 75% of Americans are aware that hypertension could lead to strokes and heart disease (Department of Health and Human Services, National Heart, Lung, and Blood Institute, 2007). This increase in knowledge corresponds with HTN awareness of 78%, treatment of 64%, and control of 45% during 2005-2006 (Ostchega, et al., 2008). General knowledge of HTN has been shown to be adequate among American adults (Oliveria, Chen, McCarthy, Davis, & Hill, 2005). However, the comprehensive understanding of elevated systolic blood pressure (SBP) readings and its significance with cardiovascular consequences are not clearly understood (Oliveria, et al., 2005; Viera, Cohen, Mitchell, & Sloane, 2008).

In a survey assessment conducted in 3 Veterans Affairs (VA) medical centers, 793 White and African Americans who were diagnosed with HTN were recruited to participate in a survey assessment (Kressin, Wang, Long, Bokhour, Orner, Rothendler, ..., Berlowitz, 2007). Participants were evaluated for: doctor-patient interactions focusing on HTN, the antihypertensive medications they were taking; socio-demographic characteristics and health beliefs as well as covariates such as trust in the physician, self-efficacy, and complexity of medication regimens. The results were that adherent patients were 1.5 times more likely to have controlled blood pressure(BP) than non-adherent patients, after controlling for BMI, age, and VA location of care ($p=.043$). Other findings showed that African Americans indicated greater

knowledge than whites and increased awareness of HTN compared to whites but was negatively associated with adherence ($p=.006$). Limitations to this study included: participants were regular users of the VA system, which could bias the sample towards individuals who are already adherent e.g. keeping appointment; the VA cares primarily for men, limiting the ability to generalize to women or to individuals in non-VA settings. When evaluating HTN knowledge, it is important to differentiate knowledge from awareness through asking specific HTN related questions that illicit people's understanding of their blood pressure values and relations to their condition. Fully understanding of patients' current status of HTN or blood pressure knowledge is necessary when exploring possible predictors of adherence to prescribed medication in African Americans.

In a descriptive study that evaluated HTN knowledge, awareness and attitudes in a hypertensive population, 826 individuals were selected to participate in an interview at the Henry Ford Medical Group in Michigan (Olivera, Chen, McCarthy, Davis, & Hill, 2005). Participants had a regular source of care and they had health insurance. Findings from completed interviews showed that 91% were taking HTN medication. The majority of the sample knew the meaning of HTN and its seriousness on their health, 91% knew that lowering BP would improve health and 96% believed that people can do things to lower their high blood pressure. When asked more specific questions about blood pressure, only 30% of the individuals could correctly identify both systolic blood pressure and diastolic blood pressure. Most patients were unaware of the importance of systolic blood pressure and blood pressure control. Findings suggested that individuals were knowledgeable about HTN in general. However, they were less knowledgeable about specifics such as what their blood pressure readings should be. This HTN knowledge deficit could result in non-adherence. Thus, when examining HTN knowledge, it is important

for investigators to use a standardized approach in assessing knowledge. The lack of consistent HTN definitions could be a contributing factor for mixed results for HTN knowledge and adherence in minority populations.

In another study, investigators conducted a telephone survey that examined blood pressure knowledge and adherence to antihypertensive medication in 295 participants who attended the Medical center of Louisiana in New Orleans' adult medicine clinic (Hyre, et al., 2007). A large majority of participants were African Americans. Each participant was given a standard script and survey software (Key Survey, Braintree, MA) was administered by a single trained interviewer. HTN knowledge was examined with a 10-item modified version of a validated tool, and adherence to anti-hypertensive medication was measured using the 8-item Morisky medication adherence scale. The internal consistency for the Morisky scale was a Cronbach's α of .7, which is adequate. Results showed no significant association between hypertension knowledge and medication adherence. Other factors that were related to lower adherence to medication included, black ethnicity, male, being less than 60 years old, being uncomfortable about asking the doctor questions, and wanting to spend more time with their provider.

In a cross-sectional study, 260 adults in the University of Nigeria Teaching Hospital (UNTH) were questioned on their knowledge and perception of HTN, demographic characteristics, tobacco use, alcohol use, fatty foods and salt intake, diet, and medications (Ike, Aniebue, & Aniebue, 2010). A large percentage of these adults reported knowledge of lifestyle measures and their effects on HTN, such as tobacco usage, 54.5%; alcohol use, 66.5% and foods high in saturated fats 76.9%. For long term, 77% believed that treatment was necessary. Even with that knowledge, 24% of respondents admitted that they stopped taking their anti-

hypertensive medications as prescribed. The main reason for not taking their medications was because they felt better after knowing the effects on HTN. Gender or educational level had no significant influence in lifestyle changes. Further examination of HTN knowledge in African American is needed to better understand how individuals' process adherence to medications based on their level of knowledge.

Conversely to prior mentioned studies, in a cross sectional study including 227 hypertensive individuals, the relationship of HTN hypertension and adherence to treatment was examined (Karaeren, et al., 2009). A questionnaire of 40 items was given in sections, patient demographics and disease and medication. Analysis showed that knowledge significantly related to the length of time that the individual used the medication (OR=6.822; 95% CI: 1.478-31.241, p=0.075), the reason for medication (OR=2.828; 95% CI: 1.445-5.543, p=0.018), cause of HTN (OR=3.447; 95% CI: 1.889-6.290, p<0.037) and knowledge of the target level of blood pressure (OR=12.859; 95% CI: 5.045-32.640, p<0.001) significantly increased the adherence rates. Thus, there were strong relations with knowledge and adherence to medications.

A study examined adherence with anti-hypertensive medications of 200 individuals with essential HTN (Balazovjeh & Hnilica, 1993). Questionnaires were given to each participant to compare the frequency of self administering and not administering antihypertensive medications. One hundred and twenty four respondents returned the questionnaires. Findings were that irregular drug taking was related to forgetting, feeling well, feeling worse prior to starting treatment and, interference with regular treatment. Knowledge of effects of HTN and antihypertensive treatment influenced adherence. Eighty two percent of individuals assumed that HTN shortened life expectancy and 88% thought that adequate treatment of HTN would prolong life. Additionally, individuals who were knowledgeable about elevated blood pressure levels

and the direct impact with decreased life expectancy demonstrated higher levels of medication adherence and keeping of appointments, than those individuals who were not aware of the importance of blood pressure ranges (Balazovjeh & Hnilica, 1993). These results may differ in an African American population.

Studies examining the relationship between HTN knowledge and adherence to medications have been inconsistent. For minority populations, there is an under-representation of studies, especially in primary care and community settings. Though some researchers have examined associations that are similar to this study, findings have been inconclusive in minority groups. For example, in a focus group study with African American women from an urban clinic, researchers found that HTN knowledge and its' management facilitated adherence to medication (Fongwa, Evangelista, Hays, Martins, Elashoff, Cowan, & Morisky, 2008). While in a survey study that consisted of 149 diabetic and hypertensive adults, predominately African Americans in primary care clinics in South Carolina, there were a large majority who self-reported non-adherence with anti-hypertensive medications despite their knowledge of blood pressure goals (Whitley, Fermo, Ragucci, & Chumney, 2006).

Although knowledge is necessary for behavioral change, it alone cannot influence medication adherence. To explain medication adherence, researchers used various behavioral models in the context of chronic disease. Some of these models include: self-regulatory model, health belief model, the theory of reasoned action, and self-efficacy theory (Azjen & Fishbein, 1980; Bandura, 1977, 1986; Leventhal, 1987; Ross, Walker, & Macleod, 2004).

The self-regulatory model was used in a cross sectional study which included 514 hypertensive patients from a hypertension care clinic. After patients completed a questionnaire about their beliefs on medicines, it was found that patients who believed that medications are

needed are more likely to adhere with their treatment (OR=3.06, CI 1.74, 5.38, $p<0.001$) (Ross, et al., 2004). Age also was a positive predictive factor in adherence for this population (OR=4.82, 2.85-8.15, $p<0.001$). The self-regulatory model proposes that individuals have “common sense” understanding of the disease, based on their emotional and cognitive view of their treatment. The utility of this model was specific to assessing perceptions of individuals’ health conditions, which limits its use for other influential factors of adherence.

The health belief model is used in several adherence studies (Horne, Clatworthy, Polmear, & Weinman, 2001; Menckeberg, Bouvy, Bracke, Kaptein, Leufkens, & Raaijmakers, 2008). This model proposes that individuals’ health decisions are based on their perceived risk of developing a disease, the perceived severity of the disease, the perceived benefits and barriers of taking preventative actions. Researchers of a cross sectional study consisting of 238 patients, found that patients’ beliefs about inhaled corticosteroids correlate with self-reported adherence and objective measure of medication adherence, which was calculated by pharmacy dispensing records (Menckeberg, et al., 2008).

The Theory of Reasoned Action is used for behavioral based studies. (Ajzen & Fishbein (1980). It proposes that behavior is determined by intention, which is predicted from subjective norms, attitudes and perceived control. This theory declares that intention to perform the behavior is a function of individuals’ attitudes toward the behavior and their subjective norm (Ajzen & Fishbein, 1980). In using this theory to explain adherence, researchers found that adherence would be viewed as an expectancy value interaction. Subsequently, the person’s attitudes, beliefs and values of their disease and its treatment will predict if they adhere or not.

Another commonly used behavioral theory is the self-efficacy theory. Self efficacy is when individuals believe in their capacity to coordinate and execute a particular task in order to

accomplish a desired outcome (Bandura, 1977, 1986). Perceived self efficacy is a major cognitive factor that affects health behaviors such as adherence (O'leary, 1985). In the Caring for Hypertension in African American Families (CHAAF) study, a cross sectional approach was used to assess chronic illness self-care behaviors among 190 African American adults with HTN and to examine psychosocial factors that influence self-care adherence (Findlow, Seymour, & Brunner Huber, 2012). Participants were interviewed on their self-efficacy and hypertensive self-care behaviors. Findings found that HTN self-efficacy is strongly associated with adherence to medication regimen, using low salt diet, engaging in physical activity, not smoking, and using common weight management strategies. In addition, self-efficacy is important for HTN self-care. These behavioral models have the potential to improve the understanding of adherence. Though, there is limited empirical evidence that showed how effective these models are in improving adherence (Munro, Lewin, Swart, & Volmink (2007).

Other related risk factors for low adherence to medication included being uncomfortable about asking the doctor questions and wanting to spend more time with the doctor. These findings highlight the importance of investigating the influence of patient related factor, expectation of care on adherence in African Americans.

Expectation of Care

Understanding patients' expectations is important for clinicians and ultimately, for health care (Cleary, 1988; Sherbourne, Hays, Ordway, DiMatteo, Kravitz, 1992). Meeting patients' expectations has been shown to produce greater patient satisfaction with care and thus, relate to greater adherence to medical therapy (Sherbourne, et al., 1991; Rao, Weinberger, & Kroenke, 2000). Expectations are defined as desires, wishes, or entitlements that affect people's beliefs about their illnesses (Kravitz, 2001; Ogedegbe, Mancuso, Allegrante, 2004; Uhlmann, et al.,

1984). Such beliefs have been shown to affect adherence to medical treatment, though the process is unclear (Horne, Clatworthy, Polmear, & Weinman, 2001; Ross, Walker & Macleod, 2004; Ogedegbe, et. al., 2004). Among patients with HTN, eliciting expectations of their care is important to understand individuals' belief about their condition and its treatments. This is particularly important for African Americans who perceive HTN as episodic and symptomatic and only take medications according to how they feel (Heurtin-Roberts & Reisin, 1992; Wilson, Freeman, Kazda, Andrews, Berry, Vaeth, & Victor, 2002).

Expectancy is manifested through expectations, which is a perception that the occurrence of a given event is possible (Uhlman, et al., 1984). Therefore, expectations are anticipations of a certain event or outcome, e.g. "I would like and expect to receive medication for my HTN; or I expect to take medication for life" (Uhlman, et al., 1984). When patients communicate their expectations for care, both their role and providers' roles are clarified, thus fostering better patient-provider relationships (Kravitz, Cope, Bhrany, & Leake, 1994). Such understandings by both parties are needed to facilitate the process of adaptation to their health condition.

Participating in one's HTN care contributes to physiologic and psychosocial adaptation (Roy, 2009; Whittemore & Roy, 2002). For this study, expectation of care is depicted as a focal stimulus, which is characterized to influence psychosocial adaptation, the role function. In using the Roy adaptation model to guide this study, the focus of this study will be on psychosocial adaptation, manifested through role function. Role function was theorized by medication adherence. It is expected that psychosocial adaptation would be reflected in patients taking medications as prescribed by their providers.

Expectation of hypertension care was explored in a qualitative study which had 93 hypertensive African Americans participants, from a primary care practice (Ogedegbe, et al.,

2004). These individuals were asked “What are your expectations of the treatment your physician prescribed for your high blood pressure?” Responses were analyzed using standard qualitative research techniques. Field notes were read several times and responses were coded into recurring concepts. An Ethnography version for Windows was used to help with the content analysis. Notes were coded independently by two investigators. Findings showed that these individuals expected their health care providers to educate them about blood pressure. They also expressed that medications will decrease their blood pressure and prevent complications such as, stroke, heart attack, and kidney failure. Although most participants expected to follow their providers’ recommendations, the majority had misconceptions about time and duration of taking their anti-hypertensive medications. Because of the qualitative design of this study, it limits valid conclusions about the findings so it was recommended to conduct larger, population based surveys. Examining whether there is a relationship between expectation of care and adherence to medications may have important implications to adherence research and HTN in clinical practice.

Previous studies that examined the relationship between expectations and compliance found conflicting results. One study examined the relationships of “patient request fulfillment” to patient compliance, glycemic control, and several other health care outcomes (Uhlmann, et al., 1988). Participants included 51 adults who were diagnosed with insulin dependent diabetes. Participants recalled 4-5 long-term requests, of which three-fourths were fulfilled. Results showed that fulfillment of participants’ requests were significantly associated with patient satisfaction, perceived health status, less insulin reactions, and greater insulin injection time reliability ($P < 0.05$). Addressing patients request was associated with some aspects of health behavior such as adherence with treatments.

In contrast in the positive relationship between expectations and adherence with treatment that was reported in the previous study, a pre-test and post test reported otherwise. In a pre-test and post test study, forty two physicians and 348 individuals who were taking prescribed medications for chronic medical conditions were randomly assigned to interventional or control group (Joos, Hickman, Gordan, & Baker, 1996). In the interventional group, physicians received training on how to manage concerns and requests of patients. Patients completed questionnaires about patients request for services prior to consequent clinic visit. In the control group, physicians received 4.5 hours of training in medical decision making. Results showed that patients perceptions of information received by the physician increased from 0.26 to 0.29 which was significant at ($P < .05$). However, the extent of change was insignificant post intervention. The intervention was not associated with changes in patient adherence with prescribed medications or appointments. Studies investigating the relationship of patients' expectations of care for HTN and adherence to prescribed medication are scant in African Americans (Ogedegbe, et. al., 2004).

Impacting on specific indicators will improve the overall health of the nation; and Leading Health Indicators for Healthy People 2010 (IOM, 2001). The study is important because it examined the exact relation between selected psychosocial factors and adherence in a sample of African Americans. Factors such as, HTN knowledge, expectations of care and social support with adherence to medications have been shown to be important.

Social Support

When defining social support in the context of adherence and social support relationship, two types of social supports are mentioned, structural and functional (Uchino, Cacioppo, & Kiccolt-Glaser, 1996; Cohen & Willis, 1985). Structural support involves marital status and

living arrangement. Functional support includes practical, instrumental, emotional, and family cohesion, which refers to the extent in which interpersonal relationships serve a particular function (Cohen, & Hoberman, 1983). These functions include, emotional support, which is caring, love and empathy; instrumental support, also known as tangible support; information, and guidance that can give solutions to a problem; appraisal support which provides self-evaluation information, and social companionship, involving time spent with others in activities of leisure and recreation (Cohen, & Hoberman, 1983; Cohen & Willis, 1985). Some studies found that social support can have a positive impact on drug adherence (Ogedegbe, et al., 2004; Morisky, Demuth, Field-Fass, Grenn, & Levine, 1985; Doherty, Schrott, Metcalf, Iasiello-Vailas, 1983). Other studies found that social support did not have positive impact.

In meta-analyses of 122 studies from 1948-2001, structural and functional social support were examined (DiMatteo, 2004). In 29 of the studies that included 2,869 participants, practical support and adherence were examined. Self report was used in a majority of the studies. Results found a strong positive correlation between practical support and adherence to treatment regimens. The odds of adherence were 3.60 times higher among those who received practical support compared to those who did not. There were higher correlations of social support and adherence to treatment among those who self-reported adherence than those who used other measurement for adherence.

In 11 studies with 1,286 participants, emotional support and adherence were examined (DiMatteo, 2004). The risk of non adherence was 1.35 times greater in patients who did not receive emotional support than those who did. In addition, for those studies who used self-reports to measure adherence there were higher correlations of adherence to treatment regimen than those who were not using self-report adherence (DiMatteo, 2004).

Fifty one studies, consisting of 14,984 adults and children investigated marital status and adherence (DiMatteo, 2004). Findings showed that the odds of adhering if married were 1.27 times greater compared to those who were unmarried. Moderating factors for the majority of studies were age group (DiMatteo, 2004). Evaluating moderators such as age and gender were recommended when investigating social support and adherence.

Twenty two studies correlated living arrangement with adherence. Participants included 3,557 adults and children. Results showed that those living with someone else, had a positive effect living on adherence (median and mean $r=.08$, $p<.05$). Other findings included, living with someone during an acute illness ($r=.25$) had a higher effect on adherence than in chronic illness (mean $r=.04$).

Furthermore, a qualitative study explored the perspectives of hypertensive African American regarding perceived barriers or facilitators of adherence to prescribed medications (Ogedegbe, Harrison, Robbins, Mancuso, & Allegrante, 2004). Participants included 106 African Americans who were hypertensive and were followed at two urban primary care practices. They were interviewed using four open ended questions that investigated the challenges and understandings to taking their prescribed anti-hypertensive medications. Interviews were conducted by the principal investigator and a grounded theory was developed. Findings showed that individual related barriers to adherence included: forgetfulness, beliefs, attitudes about the diagnosis of HTN. Facilitators to adherence included reminders, communication between physician and patient, and social support networks. Social support was identified as functional, in that, participants reported that they were encouraged to adhere to their medications. Encouragements to adhere to treatment were from family members, friends, and healthcare providers. Some limitations of this study were that participants may not have been

representative of the general population. In addition, findings were lacking in representing various socio-demographic background such as the uneducated and employed individuals. Because adherence was not measured, a causal relationship could not be established between the categories cited in this study. Therefore, further studies addressing medication adherence in African Americans were recommended.

In addition, a cross sectional study examined factors associated with poor adherence, including modifiable psychosocial and behavioral characteristics (Wang, Bohn, Knight, Glynn, Mogun, & Avorn, 2002). The study consisted of 496 hypertensive participants from a large managed care organization and a Veterans Affairs medical center. Participants completed telephone interviews, which evaluated health beliefs, knowledge, social support, locus of control and other factors. In assessing the degree of social support with taking their medications, researchers used 2 items that measured how often family or friends attempted to help the person properly use blood pressure medicines. Adherence was analyzed by the amount of medications dispensed and days supplied for each prescription for any antihypertensive medication that was filled by each participant within the 365 day period. At both facilities findings showed that there were no associations between social support and adherence. Other factors which showed no association were health beliefs, behaviors, knowledge of hypertension, or satisfaction with care and adherence to prescribed regimen. Because adherence was based on prescriptions filling, some adherent participants may have been classified as non adherence. In addition there were no formal evaluation of the reliability and validity of most of the psychosocial and behavioral scales. Therefore, this study may be limited.

On the other hand, Social support was showed to be associated with adherence. An interventional study evaluated the effect of nurse-led adherence support compared to usual care

(Schroeder, Fahey, Hollinghurst, and Peters, 2005). Participants included 245 adult men and women with uncontrolled blood pressure from 21 general practices in the United Kingdom. Participants were randomized to the interventional or control group. Individuals in the interventional group received a nurse-led adherence support intervention. A Pragmatic intervention using the self-regulatory model of illness behavior was used. These interventions included: nurses led participants in discussions of any problems with blood pressure lowering medications; nurses consulted with participants to assess whether they knew their diagnosis and agreed with their care; and nurses addressed concerns to resolve any medication problems. In addition, the interventional group received standard or usual care. The control group received standard care in that, nurses checked blood pressure at similar intervals. Adherence was measured by electronic medication monitor (MEMS) in 6 months following the intervention. Findings showed that a total of 204 participants who attended the six month follow up appointment, participants who received nurse-led adherence support had increased adherence at six months compared to participants who received standard care. Even when covariates were controlled for, e.g. age, gender, total number of drugs, and drug groups, there were no significant interaction, for age (interaction $P= 0.36$), for gender (interaction $P=0.98$), for number of drugs (interaction $P=0.23$), for drug group (interaction $P=0.12$). Findings from these studies indicate that assessing patients' perception of social support within the context of adherence could provide additional information for possible interventions.

The explanation reflected in Roy's adaptation model (Roy, 2009; Roy & Andrews, 1999; Roy 1984) proposes that individuals are adaptive systems who respond to stressors using the adaptive modes, which is represented by the role function and categorized in this study as adherence to prescribed medications. Individuals consciously create an adaptive response to

stimuli (Roy, 1999). Thus, the characteristics of the internal and external stimuli, which are represented in the focal and contextual stimuli, influence adaptive behavior which is demonstrated in the role function. A study using the Roy Adaptation model will be reviewed in this section.

A cross-sectional non-experimental study examined the role of perception and biopsychosocial adaptation in individuals diagnosed with advanced unresectable cancer who were about to receive aggressive cancer treatments (Frederickson, Jackson, Strauman, & Strauman, 1991). The conceptual framework used to guide this study was the Roy adaptation model. The study consisted of 42 participants from one of six centers that conduct Phase II clinical trials with IL-2/LAK cell therapy. The Acute Physiology and Chronic Health Evaluator (APACHEII) were used to measure the physiologic focal stimulus, symptoms from the cancerous tumor. Reliability of the APACHEII was not reported. The Symptom Distress Scale (SDS) was used to measure the symptoms perceived by the participant. Reliability of the original SDS produced a coefficient alpha of 0.82 (Mc Corkle & Quint-Benoliel, 1983). The Sickness Impact Profile was used to measure the participants' perception of their cancer on psychosocial adaptation, the self-concept, and role function and interdependence modes. Reliability was $r=0.92$ and internal consistency $r=0.94$.

Participants were asked to answer the questionnaires upon being admitted to the treatment area. Findings showed positive relationship between actual physiological status and perceived physiological status or physiological adaptation (correlation coefficient= 0.13); positive correlation between actual physiological status and psychosocial adaptation (correlation coefficient= 0.17); and positive and significant relationship between perceived physiological adaptation and psychosocial adaptation (correlation coefficient= 0.60 , $p<.0001$). These results

supported the model's predictions that perception of symptoms is positively related to psychosocial adaptation. Perception of symptoms and psychosocial adaptation were correlated with longer survival as opposed to actual physiological status. Similarly, this study is guided by the proposition that postulates that the stimuli directly influence the mode of adaptation.

Other studies showed varying levels of support according to gender. For instance, a randomized control trial of hypertensive individuals found that African American women living alone were more adherent than those women living with someone else and African American men who lived alone were less adherent than those men who lived with someone else (Braverman, et. al, 2009). Major strengths of this study included a randomized sample of participants who were a part of a larger clinical trial, and medication adherence was assessed using the medication Event Monitoring System (MEMS), which is regarded as a gold standard in clinical research.

A qualitative study found that African American men perceived that social support was from their mothers or sisters, not necessarily from others participating in their care (Rose, Dennison & Hill, 2000). Some limitations to this study included a low sample size, consisting of only African American men, thus, preventing generalization to other African Americans. These findings do not provide strong evidence for the study. This present study used a large heterogeneous sample of African Americans and a quantitative design to investigate gender and social support and the impact on adherence. While these studies show that social support influence adherence, we found that there was a lack of adequate reporting on how social support was measured. Since different kinds of social support affect African American women differently from men, it is importance to establish a standard for the type of social support. For example, men classify structural support as social support, e.g., support from interpersonal

relationships as being social support and women view social support as functional or structural, e.g. from various sources, it is necessary to establish a consistent standard for measure social support, which include both structural as well as functional support. This study uses the MOS scale, which assesses both types of social support. Additionally, studies reviewed in these findings showed methodology used were predominately cross sectional, understanding the influence of social support on adherence in African American men and women over time, particularly in longitudinal studies could provide important implications to adherence research and HTN clinical practice. For African Americans, spirituality is classified as a type of social support.

Spirituality has been shown to positively impact adherence to medication in hypertensive African Americans (Lewis & Ogedegbe, 2008). A study examining the efficacy of a HTN education and support program in African American churches for hypertensive individuals, found a positive relationship between social support and adherence to medication (Smith, Merritt, & Patel, 1997). An experimental study found that there was a positive relationship between spirituality and adherence/ blood pressure control in 83 older African Americans (Walker, 2000). Studies showed that in the African American communities, the church is a common source of social support, which facilitates health promotion (Graham, Kim, James, Reynolds, Buggs, Hunter, ... Burwell (2006); Smith, et al., 1997; Walker, 2000).

An interventional study examined the impact of cardiovascular risk profiles of 529 African American women age 40 and older (Yanek, Becker, Moy, Gittelsohn, & Koffman, 2001). Three interventional strategies were compared, one group was a non-spiritual self- help group, the active interventional group was a behavioral group, which was supplemented with a spiritual and church cultural component and the third group was the control group with standard

methods. All interventions were developed through partnerships between community member and investigators. Findings showed significant improvements in body weights and systolic blood pressure for the interventional group with the spiritual component. One year after the program initiation, the participants of the spiritual intervention achieved clinically important improvements in cardiovascular risk profiles.

Features of this study that differs from previous studies include a large random trial selection of African Americans from a secondary data analysis. Many of the present studies used smaller samples of African Americans. In addition, there has been a limited amount of studies examining these proposed factors in the context of medication adherence for African Americans. Patients' satisfaction with their providers predicts adherence to medications. It is recommended that all clinicians provide patient centered care (Chobanian, et al., 2003).

Gaps in the Research Findings and Present Study Solutions

These research findings yielded important insights regarding expectation of care and adherence to medications. While studies showed that patient level factors such as self-efficacy and depression influence adherence to medication, we found no studies performed to establish whether there is a relationship between the perceived roles of the patient and the provider through patients' expectation of care and adherence to medication. Examining relationships between patient and providers from the patients' perspective may provide important clinical implications and further insight of hypertensive African American's perceptions of their providers' communication (Lewis, et al., 2012).

Sufficient evidence has been presented in the research findings showing that social support influences adherence to medications. However, more studies are needed with consistent

social support measurement scale. For this current study the MOS scale was used to measure social support, which has a high reliability score.

While the relationship of HTN knowledge and adherence has been studied, findings are inconclusive and limited in the African American population; further studies are needed that use a standard definition for HTN knowledge and a consistent measure. Examining the influence of HTN knowledge on adherence by using a consistent definition may have important implications to adherence research and HTN management. There is a paucity of studies which used the RAM to explain the process of adherence to medications in minority populations

Summary

This chapter reviewed the literature regarding the study's variables, Adherence to medications, HTN knowledge, expectations of care, and social support and their relationships with socio-demographic factors. A review of the epidemiology of hypertension, the public health burden of uncontrolled blood pressure, and the importance of adherence to anti-hypertensive medications were presented. This review highlighted the gaps in the literature regarding whether HTN knowledge, expectation of care, and social support predicted adherence to anti-hypertensive medications. It was noted that there is inadequate studies evaluating these variables in African Americans. Finally, there is a scarcity of research on expectation of care and adherence to medication in African Americans. Based on this review, further research is needed to better understand the factors affecting adherence to anti-hypertensive medications in African Americans.

Chapter III

Methods

The purpose of this study was to examine the relationships of HTN knowledge, expectations of care, and social support, with adherence to prescribed medications in African Americans with hypertension. This study used data from the Counseling African Americans to Control Hypertension (CAATCH) clinical trial study, collected from 2004 - 2011 (Ogedegbe, et. al., 2009). The dataset included information on demographic, clinical, psychosocial, and behavioral characteristics in African Americans who received care in Community Health Centers in the New York City, Metropolitan area. Data were collected at baseline, 2weeks post-baseline (Visit 1) and every three months for the next 12 months (Visits 2-5). This chapter describes the method used in the CAATCH study, hereafter referred to as the parent study. In addition, this chapter described the sample variables used and data analysis for this study.

The Parent Study

The parent study was conducted in 30 community Health Centers (CHCs) within the New York City Metropolitan area. Participants included hypertensive African Americans who were receiving care in 30 CHCs. This study is a cluster randomized trial, consisting of two interventions. One group received the Intervention Condition(IC) and the other group received the Usual Care (UC). Participants in the IC group received interactive hypertension education, home blood pressure monitoring, and monthly behavioral counseling. Providers in the IC group received clinical feedback based on their patients' blood pressure readings and chart audits. Participants in the usual care group received printed information on how to lower blood pressure, facts about the eating plan on dietary actions to stop hypertension (DASH), and four educational

group sessions on benefits of mineral and vitamin supplementations. Providers in the UC group received the JNC-7 guidelines and a laminated referenced card of the JNC-7 treatment algorithm.

At each of the thirty CHCs, fifteen participants were randomly assigned to either the IC or the UC group. This study tested the hypothesis that patients who were randomized to the intervention condition (IC) in 12 months would have a higher rate of blood pressure control, which means a greater reduction in both systolic blood pressure (SBP) and diastolic blood pressure (DBP), as well as increased maintenance of the intervention effect one year after completion of the trial than the usual care group (Ogedegbe, et al., 2009).

Sample

This parent study had 30-36 participants at each of the thirty CHC. Each CHC was selected based on at least 25% of their participants who self-identified as African Americans. Inclusion criteria included: African American, being at least 18 years old, receiving care at the CHC for at least 6 months, English speaking, Mini Mental Status Examination (MMSE) score >24, having a diagnosis of HTN (International Statistical Classification of Diseases and Related Health Problems: 401-401.9) and uncontrolled blood pressure at the last office visit (blood pressure >140/90), taking at least one antihypertensive medication. In addition, at the time of consent, participants had to have uncontrolled blood pressure. All participants provided informed consent for this study. Health care providers were selected if they had at least five patients who met the criteria for the study.

Data Collection Procedure

Data collections were conducted after the approval by the institutional review board. After obtaining consent, the research assistants (RAs) assessed if all participants met the study's inclusion criteria. Participants' self-reported data included socio-demographic information such

as age, gender, household income, education level, marital status, employment status, nativity status, and health insurance status.

Participants who met the criteria had their blood pressure (BP) measured with a validated automated BP monitor. Prior to assessing their BP, participants were seated comfortably for 5 minutes (Periff, Grim, Flack, Frohlich, Hill, McDonald, et al., 1993). After three BP measurements were collected, the average was calculated, height and weight were measured without shoes, using a tape rule and a validated digital scale, and laboratory procedures were performed. Data were obtained from the chart, which included medical co morbidity, anti-hypertensive medications and dosages. The RAs administered questionnaires on medication adherence, HTN knowledge, dietary intake, and health related qualities of life. The questionnaires measuring social support and expectations of HTN care were introduced at visit 5. Interventions were conducted by the recruitment coordinators.

The data included were collected during a period of 12 months, after which, a chart review was conducted at 24 months to evaluate if the interventions were maintained in both groups. For this analysis, that data collected during the 12 months was used. Data were de-identified by the study coordinator to protect patients' confidentiality. The original data were entered into a database by research assistants and kept in a secure location. The dataset was presented in an IBM SPSS file.

Instruments

Validated self-reported instruments used in the CAATCH study that relate to this current study included adherence to medication, the Morisky scale, HTN knowledge questionnaire, Blood Pressure Outcome expectation of care questionnaire, social support scale (MOS)

(Morisky, et. al., 1986; Carter-Edwards, et al. 2002; Ogedegbe, et. al., 2009; Cohen & Syme, 1985; House and Kahn, 1985; Sherbourne & Stewart, 1991).

Current Study

This dissertation study used a cross sectional research design; this design allows for participants to be evaluated at a single point in time. This study used baseline data on socio-demographics and information collected at the 5th visit, 12 months in the parent study. At the 5th visit, participants provided responses to questions pertaining to all variables in this present study, HTN knowledge, Expectation of care, social support and adherence to prescribed medications.

This current study sample consisted of African Americans age 18 and above who provided responses to the questionnaires used to measure the variables HTN knowledge, Blood Pressure Outcome Expectations of Care, which will be referred to as Expectations of Care, Medical Outcomes Study (MOS), Social Support and Adherence to Prescribed Medications. This analysis was limited to individuals who self-identified their race as Black or African American regardless of their ethnicity, (Hispanic or non-Hispanic), a total of 1059 individuals. An exploratory analysis was conducted to select the sample for this study. Of the 1059 participants enrolled in the parent study, there were 537 in the intervention group and 522 in the normal group. The demographics such as age, insurance status, and income did not differ significantly from cases in the intervention group. From the control group of 522 cases, data were checked for all the variables being used in this present study. There were a total of 387 records selected from the normal group. Records were obtained from the normal group in order to prevent exposure to the intervention, thus limiting any impact on this current study (Lewis, Schoenthaler, & Ogedegbe, 2012).

Study Variables

For this study, the theoretical concepts are: (a) adherence to prescribed medications, (b) Hypertension knowledge, (c) expectations of care, (d) social Support, and (e) patient's socio-demographic factors. According to the conceptual model, adherence to prescribed medication is influence by HTN knowledge, expectations of care and social support. Therefore, Adherence to prescribed medication is considered the dependent variable. Independent variables are: (a) hypertension knowledge, (b) expectations of care, (c) social support, (d) age, (e) gender, (f) marital status, (g) education, (h) employment status, (i) income, and (j) insurance status. The theoretical concepts, data category, variable names, and appropriate measures are presented in Table 2

Table 2: Operationalization of Variables in This Study

Theoretical Concept	Variable Names	Data Category	Measure
Adherence	Adherence to prescribed medication	Categorical	Morisky Adherence (Morisky, et.al., 1986) HTN Knowledge
Hypertension Knowledge	HTN Knowledge	Categorical	Questionnaire (Carter-Edwards, et. al., 2002) Blood pressure
Expectation of care	Expectation of care	Continuous	Outcome Expectations Questionnaire (Ogedegbe, et.al., 2009)
Social support	Social Support	Continuous	Medical Outcomes Study (MOS) Social Support Survey (Cohen & Syme, 1985; House and Khan, 1985; Sherbourne & Stewart, 1991)
Covariates	Age Gender Marital Status Nativity Status Education Employment Income Insurance	Continuous Categorical Categorical Categorical Categorical Categorical Categorical Categorical	Demographic Data sheet Demographic Data Sheet

To investigate predisposing variables on adherence to prescribed medications, age, gender, marital status, education, employment, income, and insurance were included in the statistical model. The following section addressed instruments used in this study.

Instruments

Morisky Adherence to Medication Questionnaire:

The Morisky Adherence to medication questionnaire was developed to evaluate adherence to medications in patients diagnosed with hypertension (Morisky, et al., 1986). Since then the Morisky scale has been used and validated to measure adherence in individuals with various conditions, such as asthma and diabetes (Brooks, Richards, Kohler, Soong, Martin, Windsor, Bailey, 1994; Hill-Briggs, Gary, Bone, Hill, Levine, Brancati, 2005). The psychometric testing of this instrument was conducted with 400 participants in two outpatient clinics in a large teaching hospital over 42 months (Morisky, et al., 1986). The population studied included 91% African Americans, 70% female, median age of 54 years old, and a median of 8 years of formal education. The Morisky scale was first designed as a 5-item scale, one item measured medication taking behavior in outpatients who were being treated for high blood pressure. This 5 item scale was later revised to a 4 item scale that use dichotomous response, yes or no.

The questions used to determine adherence in Appendix A include: 1). Do you ever forget to take your medication? 2) Are you careless about taking your medication? 3) When you feel better do you sometimes stop taking your medicine? 4). Sometimes if you feel worse when you take your medicine, do you stop taking it? A response of yes is coded as 1 and a response of no is coded as 0. The coding of each question was reversed because most patients like to give their health care providers positive answers when exploring adherence to regimen. Hence, the sum of yes answers provided a composite measure of low adherence to non-adherence while no answers provided a measure of high adherence. Because the questions were framed to indicate no as being adherence, for this study no was re-coded as 1 and yes was re-coded as 0. Thus, a

higher score would indicate adherence. The answers to the 4 items were calculated for a continuous adherence score ranging from 0-4. A total score of ≤ 2 was classified as non-adherence and a total score of ≥ 4 was adherence. These cut off points have been consistent in other studies that used the Morisky Adherence scale (Patel & Taylor 2002; Sung, Nichol, Venturini, Bailey, McCombs, & Cody, 1998). Reliability testing showed a Cronbachs alpha of 0.61, consistency score. Another study using this instrument among individuals with HTN in the inner city found that the Morisky instrument yielded a Cronbach alpha of 0.91 (Shea, Misra, Ehrlich, Field, & Francis, 1991). One possible reason for such variance in the reliability score of 0.61 in one study and 0.91 in another study with predominately inner city minority individuals could be related to inconsistencies in conditions when administering the questionnaire to each population (Waltz, Strickland, & Lenz, 2005).

Hypertension Knowledge Questionnaire

Hypertension Knowledge was assessed using a 17 items questionnaire, which was developed by the National Heart, Lung, and Blood Institute for use among nonmedical personnel (Carter-Edwards, Jackson, Runaldue, & Svetkey, 2002; see Appendix B). The HTN knowledge questionnaire in Appendix B was scored by averaging all 17 items. Scale values range from 0 to 1, 0= no and 1= yes. All items were scored in the positive direction. Higher scores indicate greater HTN knowledge. Reliability testing showed a Cronbachs alpha of 0.50. One reason for such low score of 0.50 is because the majority of the questions required a yes answer. Some participants may perceive that some answers should be answered as no instead of yes. Perhaps, a likert scale with variations in the answers, such as strongly agree, agree, disagree, or don't know may have been more applicable for this population.

Blood Pressure Outcome Expectations Questionnaire

The Blood Pressure Outcome Expectations Questionnaire- Counseling African Americans to Control Hypertension (CAATCH) Study (Ogedegbe, et al., 2009), a 25 item self-administered questionnaire is presented in Appendix C. The Outcome expectations questionnaire assessed the expectations that patients have about their medical treatments and blood pressure care. There are three subscales for this questionnaire: the appropriate expectation (+), inappropriate expectation (-), and the expectation may be appropriate (+/-). Each required a separate score. The higher scores on the appropriate expectation subscale are reflective of good outcome expectations for appropriateness. The low scores on the inappropriate expectation subscale reflect good outcome expectations for inappropriateness; and median scores should reflect the expectation may be appropriate subscale. Raw scores were summed and divided by the number in the respective subscales. Scoring is based on the number question being answered and subscale use a 5- point likert type scale from “1” Strongly disagree to “5”, Strongly agree. There was no reliability or validity score reported on this instrument.

This investigator used the Statistical Package for Social Sciences (SPSS), version 20 (2011) to conduct an exploratory factor analysis for the Blood Pressure Outcome Expectations Questionnaire (Findings are presented in Table 3). The principal axis factoring was used to extract the factors. A Scree plot was used to determine the number of factors that should be retained. An orthogonal varimax rotation was used to rotate the factors. Several items from the questionnaire had communalities below .40 and therefore, those items were deleted. Those items were 1,2,4,8,9,10,11,18,19,20,21, and 25, leaving 12 items. There were four factors accounting for 76% of the variance. The first factor consists of items pertaining to prevention of fatal outcomes. Number 12 “I will not have a stroke if I take my blood pressure medication”, #13, “I

will not have a heart attack if I take my blood pressure medication”, #14, “ I will not have kidney failure if I take my blood pressure medication” Therefore, the first factor can be labeled the Prevention of Fatal Outcomes factor. The items which loaded on the second factor pertained to non-adherence to lifestyle behaviors. Number 15, “I do not have to lose weight or exercise as long as I take my blood pressure medication”, #16, “I do not have to reduce the amount of salt in my diet as long as I take my blood pressure medication”, #17, “I do not have to reduce the amount of fat in my diet as long as I take my blood pressure medication” Thus, this factor can be labeled Non- adherence to lifestyle behaviors. The items which loaded on the third factor pertained to Patients expectation of physicians. Number 5, “ I expect my doctor to check my blood pressure every time I see him”, #6, “I will take my blood pressure medication as long as my doctor says I need it”, #7, “It is up to me to take my blood pressure medication as directed by my doctor.” Accordingly, the third factor can be described as patients’ Expectation of physicians. The fourth factor consists of items pertaining to positive outcomes of taking blood pressure medication. Number 22, “The blood pressure medication will help me live longer.” #23, “The blood pressure medication should improve my health.” #24, “I will feel better if I take my blood pressure medication.” Thus, the fourth factor can be described as the Positive Outcomes factor.

Table 3: Rotated Factor Matrix for the Expectations Items

Item	1	2	3	4
Q5	.00	-.15	.65	.19
Q6	.01	-.06	.81	.22
Q7	.01	-.04	.80	.05
Q12	.85	.07	.01	.22
Q13	.91	.09	.02	.18
Q14	.81	.14	-.01	.15
Q15	.21	.64	-.11	.03
Q16	.07	.86	-.05	-.05
Q17	-.01	.94	-.08	.02
Q22	.15	.04	.12	.69
Q23	.19	-.05	.13	.68
Q24	.12	.00	.17	.64

The Medical Outcomes Study (MOS), Social Support Survey

The Medical Outcomes Study (MOS), the MOS Social Support Survey is a self-administered 19 item questionnaire [see Appendix D] measuring the multi-dimensional functional characteristics of availability of perceived social support (Cohen & Syme, 1985; House and Kahn, 1985; Sherbourne & Stewart, 1991). Social support is defined as an interpersonal interaction of one or more of the following, instrumental aid, information or appraisal, or emotional concern (House, 1981). The MOS survey measures five dimensions of functional support: (1) emotional support; (2) informational support, (3) tangible support;

positive social interaction; and (5) affectionate support. Questions include how often is each of the following kind of support available to you if you need it?, “Someone you can count on to listen to you when you need to talk”. The survey uses a likert scale ranging from 1 to 5, 1 reflects a response of none of the time, 2, little of the time, 3, some of the time, 4, most of the time, 5, all of the time. This survey takes approximately 10 minutes to complete. Questions include: This survey was administered via paper and pencil, telephone, and as an electronic survey.

The psychometrics testing was conducted and results are as follows: discriminant validity/ Convergent Validity range from 0.72-.0.90 (Sherbourne & Stewart, 1991). Construct validity of 0.88. Reliability- internal-consistency was tested and Cronbach’s alpha of each subscale showed: emotional support scale, 0.96; tangible support, 0.92; positive interaction, 0.94; affection, 0.91; overall support index, 0.97. To calculate a score for each subscale, the average of the scores for each item in the subscale was calculated. To obtain an overall support index, the average of the scores of 18 items included in the 4 subscales, and the score for one additional item were calculated. The higher score for an individual subscale or the overall index indicates more support.

Data Management

Data were originally entered into a database by the research assistants and safely secured. Data management procedures were conducted using the SPSS (statistical package for the social sciences) version 20 for statistical analysis by the investigator.

Data Analysis

All data were analyzed using SPSS, version 20. Data were examined to identify inconsistencies and outliers. Descriptive statistics such as, dispersion and measure of central tendency were conducted to characterize the distribution of all variables. This procedure was

performed to determine if all data met the appropriate assumptions required for regression analyses and to decide if transformation of data were required (Munro, 2005). Descriptive statistics were generated for baseline demographic data (e.g., frequencies, standard deviations, means, percentages and normal probability plots for continuous variables) and the measures. Statistical analysis of each measure assisted in revealing continuous and categorical variables. Demographic data (e.g., age, gender, marital status, nativity status, education, employment status, income, and insurance status) in this adult population were explained using means and standard deviations for continuous variables and proportions for categorical variables. To determine significant differences, the χ^2 statistic was used for the categorical variables. Logistic regressions were used to determine the strength of the associations between the dichotomous, dependent variable, self-reported adherence to prescribed medications, predictor variables, HTN knowledge, expectations of care, and social support, among adult African Americans. The Hosmer - Lemeshow Test was examined for model fit. The Cox & Snell R Square and the Nagelkerke R Square were examined for variance in the dependent variable, adherence to prescribed medication. The Wald test was evaluated for the importance of each predictor variables (Tabachnick & Fidell, 2007). Pearson correlations were also used. Each analysis was based on the research aims and hypotheses as listed below:

Research Aim 1

To address Research Aim 1, the researcher examined the relationship between Hypertension knowledge and adherence to prescribed medications before and after adjusting for age, gender, marital status, nativity status, education, employment status, income, and insurance status. For Aim 1, it was hypothesized that hypertension knowledge was associated with positive adherence to prescribed medications before and after controlling for age, gender, marital status,

nativity status, education, employment status, income, and insurance status related to adherence. To examine the relationship between hypertension knowledge and adherence to prescribed medications, a univariate logistic regression procedure was conducted.

Research Aim 2

To address Research Aim 2, the researcher examined the association between expectations of care and adherence to prescribed medications before and after controlling for age, gender, marital status, nativity status, education, employment status, income, and insurance status. For aim 2, it was hypothesized that expectations of care was associated with positive adherence to prescribed medications before and after controlling for demographic and health variables related to adherence. To examine the relationship between expectations of care and adherence to prescribed medications, a multiple logistic regression procedure was conducted.

Research Aim 3

To address Research Aim3, the researcher examined the relationship between social support and adherence to prescribed medications before and after controlling for age, gender, marital status, nativity status, education, employment status, income, and insurance status. For aim 3, it was hypothesized that social support was positively associated with adherence to prescribed medications before and after controlling for age, gender, marital status, nativity status, education, employment status, income, and insurance status. To examine the relationship between social support and adherence to prescribed medication, a logistic regression was calculated.

Research Aim 4

To examine Research Aim 4, the researcher examined whether the associations in aims 1, 2 vary with age, gender, education, income, and insurance status. For aim 4, it was hypothesized

that the association between hypertension knowledge and adherence to prescribed medications is stronger among those younger than 60 years old, female, highly educated than among their counterparts aged 60 years and older, male, and less educated. It was also hypothesized that the association between social support and adherence to prescribed medications is stronger among those older than 45 years, men, and highly educated than among their counterparts aged 45 years and younger, with less education. The statistical significance for all tests was set at $\alpha < .05$.

Research Aim 5

To examine Research Aim 5, the researcher examined the associations among the focal stimuli, HTN knowledge, expectation of care, social support, and the contextual stimuli, age, gender, marital status, nativity status, education, employment status, income, and insurance status on role function, adherence to prescribed medications. For aim 5, it was hypothesized that the focal and contextual variables as listed above, positively impacted adaptation. To examine these associations, a Spearman Rho Correlation analysis between the focal, contextual and role function variables. After which, a logistic regression analysis was conducted.

Summary

This chapter outlined information about the parent study, data collection, the proposed study variables, data management, and analyses. This proposed study's aims and hypotheses were presented. In subsequent chapters, the results, discussions, and implications of the findings will be presented.

Chapter IV

Results

The purpose of this study was to examine the relationships of HTN knowledge, expectations of care, and social support, with adherence to prescribed medications in African Americans with hypertension. This chapter presents results of the study. In the first section, the descriptions of the sample are presented. Following this, the preliminary screening procedures are described. Thereafter, the descriptive statistics pertaining to the main study variables are summarized. The final section includes univariate and multivariate analyses testing the study hypotheses.

The purpose of this secondary data analysis was to examine the relationships of HTN knowledge, expectations of care, and social support, with adherence to prescribed medications in African Americans with hypertension. This chapter presents results of the study. First, the demographic descriptions of the sample, main analysis of the independent and dependent variables, descriptive statistics and reliability of the instruments used in this study. The final section includes univariate and multivariate analyses of control variables; e.g. age, gender, marital status, nativity status, education, employment status, income, and insurance status on the dependent variable, adherence to prescribed medications. Additionally, logistic regressions were conducted to test the specific aims of the study using data from the 5th visit of the CAATCH study.

The aims of the study were:

1. To examine the relationship between HTN knowledge, adherence to prescribed medications, after controlling for socio-demographic factors.

2. To examine the association between expectations of care and adherence to prescribed medications, after controlling for socio-demographic factors.
3. To examine the relationship between social support and adherence to prescribed medications, after controlling for socio-demographic factors.
4. To examine whether the associations between HTN knowledge and social support, on the one hand, and adherence to prescribed medications varied across levels of several socio-demographic factors.
5. To examine whether the focal stimuli, HTN knowledge, expectation of care, and social support, and contextual stimuli, age, gender, marital status, nativity status, education, employment status, income, and insurance influence adaptation, adherence to medication (the Roy Adaptation Model Proposition).

Descriptive Statistics

This study sample was comprised of 387 African Americans from a normal distribution of the CAATCH study who had been diagnosed with uncontrolled blood pressure. All statistical analyses were done using IBM SPSS, version 20 (2011). Records that had missing values or incomplete responses were excluded from the analyses via listwise deletion (Miller, 2005). After excluding variables with missing values, a total of 387 records were selected from the normal group in this cross sectional quantitative study.

Description of the Sample

Descriptive statistics for the sample of participants who responded to the questions on adherence are summarized in Tables 4 and 5. Respondents who adhered to their blood pressure medications were between 30 and 92 years old. The mean age was 59.48 (SD=11.78). The majority of the respondents who adhered to their blood medications were female (74%). A

majority of the respondents earned income \$40,000 and below (90%) and the majority were born in the United States (67.4%). More than half of the respondents did not complete a two or four year college degree (86.5%). Thirty one percent were never married and 25.6% were married. The rest were divorced (16.1%), separated (7.3%), or widowed (14.3%). Most of the respondents were not employed (60.8%). The majority of the respondents did not have an HMO (65.5%), Medicare (55.7%), private insurance (74.7%), or veteran's administration sponsored insurance (97.8%) but only 36% did not have Medicaid. Respondents who did not adhere to their blood pressure medications were between 27 and 83 years old. The mean age was 52.81 (SD = 10.71). As shown in Table 4, majority of the respondents who did not adhere to their blood pressure medications were female (78.4%). Majority earned 40,000 and below (90.2%) and were born in the United States (66.7%). More than half of the respondents did not complete a two or four year college degree (87.5%). Thirty-three percent were never married and 20.3% were married. The rest were divorced (17.5%), separated (9.6%), or widowed (11.4%). Majority of the respondents did not have an HMO (56.3%), Medicare (72.7%), private insurance (71%), but only 14.9% did not have Medicaid.

Preliminary Screening Procedures

Univariate Normality

Mean composites were created for the HTN knowledge, Expectations of Care, and Social Support scales. A total score was created for the adherence to prescribed medication scale. The mean and total composites were assessed for univariate normality by using their skewness and kurtosis indices, which was calculated by skewness statistic /standard error. Skew indices above three indicated non-normality. Kurtosis indices were calculated by kurtosis statistic/ standard error, indices between 10 and 20 indicated non-normality (Kline, 2011). The findings presented

in table 6 indicate that all variables were highly skewed except for the Expectation of Care subscale entitled, May be Appropriate. The positively skewed variable was transformed using a natural log function (Tabachnick & Fidell, 2007). For the negatively skewed variables, a three step procedure was followed (Tabachnick & Fidell, 2007). The variables were reverse-coded using natural log function, which yielded acceptable skewness and kurtosis to be used in subsequent procedures.

Table 4: Frequencies and Percentages for the Demographic Variables

Variables	Adherent(N=273)		Non-Adherent(N=114)	
	N	%	N	%
Gender				
Male	68	24.9	24	21.1
Female	202	74.0	87	76.3
Annual household income				
1 (<\$10,000)	97	35.5	36	31.6
2 (\$10,000-19,999)	72	26.4	28	24.6
3 (\$20,000-39,999)	59	21.6	28	24.6
4 (\$40,000-59,999)	15	5.5	10	8.8
5 (\$60,000-100,000)	8	2.9	0	.0
6 (> \$ 100,000)	2	.7	0.0	.0
Country born in				
United States	184	67.4	76	66.7
Puerto Rico	5	1.8	6	5.3
Other	68	24.9	22	19.3

Table 5: Frequencies and Percentages for the Demographic Variables

Variable	Adherence (N=273)		Non-Adherence (N=114)	
	N	%	N	%
Highest Level of Education				
Less than high school	84	32.3	37	35.6
High school/technical school	95	34.8	24	21.1
Some college	46	16.8	30	26.3
Associates	7	2.6	3	2.6
Bachelors	18	6.6	6	5.3
Graduate school	10	3.6	4	3.5
Marital status				
Never Married	85	31.1	38	33.3
Married	70	25.6	23	20.2
Divorced	44	16.1	20	17.5
Separated	20	7.3	11	9.6
Widowed	39	14.3	13	11.4
Employment Status				
Not Employed	166	60.8	61	53.5
Employed	88	32.2	35	30.7

Table 5 (Continued)

Variable	Adherent (N = 273)		Non-Adherent (N = 114)	
	<i>N</i>	%	<i>N</i>	%
Have an HMO				
No	108	39.6	36	31.6
Yes	57	20.9	28	24.6
Have Medicaid				
No	68	24.9	17	14.9
Yes	121	44.3	59	51.8
Have Medicare				
No	97	35.5	40	35.1
Yes	77	28.2	15	13.2
Have private insurance				
No	118	43.2	44	38.6
Yes	40	14.7	18	15.8
Have veteran's insurance				
No	270	97.8	114	100.0
Yes	3	1.1	0	.0

Table 6 : Skewness and Kurtosis Statistics for the Study Variables

Variable	<i>N</i>	Skewness	Kurtosis
Hypertension knowledge	328	-1.28	2.68
Social support			
Emotional/informational	393	-.58	-.34
Tangible	393	-.72	-.37
Affectionate	393	-1.14	.41
Positive social interaction	393	-.73	-.36
Outcome expectations			
Appropriate	393	-.72	4.11
Inappropriate	393	.78	1.41
Maybe	393	.12	-.57

Note. Skewness *SE* for hypertension knowledge = .14. Skewness *SE* for all other variables = .12.

Kurtosis *SE* for hypertension knowledge = .27. Kurtosis *SE* for all other variables = .25.

Screening for Outliers

To detect univariate outliers, the composites were standardized; any case whose standardized values exceeded the absolute value of 3.29 was considered as outliers (Tabachnick & Fidell, 2007). There were three cases with standardized values above 3.29; one case had an Appropriate Expectations value above the absolute value of 3.29 and two cases had an Inappropriate Expectations value above the absolute value of 3.29. Thus, these six cases were deleted from the dataset, resulting in 387 from 393. For the HTN knowledge questionnaire there were 331 cases who responded. However, there were three outliers, which were deleted from the

dataset, leaving 328. Descriptive data comparing the characteristics of age, education, and income for cases with the missing responses were conducted.

Descriptive Statistics and Reliability of the Measures for This Study Variables

The independent variables for this study include hypertension knowledge, blood pressure outcome expectations of care, which is referred to as expectation of care, social support, and the dependent variable is adherence to prescribed medications. This section begins with hypertension knowledge.

Hypertension Knowledge

Hypertension knowledge is a main independent variable that represents a foundational theoretical concept in the conceptual model used in this study. Cronbach's alpha for the Hypertension Knowledge measure was .38, which was below the acceptable criterion of .70 (Nunnally & Bernstein, 1994). Because three items, i.e. 9, 10, and 11 had negative item-total correlations, these items were dropped, thus, the alpha increased from .38 to .46.

Table 10 presents the descriptive statistics and Cronbach's alpha for the HTN measure. The highest possible hypertension knowledge score was one; the mean knowledge score was .91 (SD=.09) thus indicating that the sample of respondents was knowledgeable about hypertension. Because there was limited variability in HTN knowledge scores, a dichotomous variable was created; respondents who did not get a perfect score of one were categorized into the "Less than Perfect" group (N = 215) while respondents who got a perfect score of one were categorized into the "Perfect" group (N = 107). This dichotomous variable was used in subsequent inferential procedures.

The HTN knowledge questionnaire had a large amount of missing responses (i.e., 59). Thus, chi-square analyses were conducted for missing and non-missing scores across levels of

the control variables (i.e., gender, income, education, marital status, work status, and insurance status) to determine whether the pattern of missing values was random or systematic.

The absence or presence of HTN knowledge scores did not vary significantly across income levels ($\chi^2 (5) = 4.76, p = .445$), across categories of marital status, $\chi^2 (4) = 2.35, p = .671$, and across work status, $\chi^2 (1) = 2.38, p = .123$. But, as shown in Table 7, the absence or presence of HTN knowledge scores varied significantly across gender, $\chi^2 (1) = 4.12, p = .042$. More males (23.7%) than females (14.6%) did not have HTN knowledge scores.

Table 7: Frequencies and Percentages for HTN Knowledge Missing and Non-Missing Values by Gender

Gender	No HTN Score		Has HTN Score	
	Frequency	Percentage	Frequency	Percentage
Male	22	23.7	71	76.3
Female	43	14.6	251	85.4

Note. Absence or presence of HTN Knowledge score varied significantly across gender, $\chi^2 (1) = 4.12, p = .042$.

In addition, as shown in Table 8 the absence or presence of HTN knowledge scores varied significantly across levels of education, $\chi^2 (9) = 18.96, p = .025$. Respondents that were uneducated (0%), completed a Bachelors' degree (8%) and attended some graduate school (8.3%) had a minimal number of missing HTN knowledge scores.

Table 8: Frequencies and Percentages for HTN Knowledge Missing and Non-Missing Values by Level of Education

Level of Education	No HTN Score		Has HTN Score	
	Frequency	Percentage	Frequency	Percentage
Not Educated	0	0	4	100.0
Eighth grade	9	23.7	29	76.3
Ninth grade	17	21.3	63	78.8
High school	19	16.5	96	83.5
Technical school	2	40.0	3	60.0
Some college	9	11.5	69	88.5
Associates degree	3	27.3	8	72.7
Bachelors' degree	2	8.0	23	92.0
Some graduate school	1	8.3	11	91.7
Graduate degree	2	100.0	0	0.0

Note. Absence or presence of HTN Knowledge score varied significantly across levels of education, $\chi^2(9) = 18.96, p = .025$.

Lastly, as shown in Table 9, the absence of Hypertension Knowledge scores was significant across HMO status, $\chi^2(1) = 20.09, p = .001$. Twenty-nine percent of respondents without an HMO did not have HTN knowledge scores but only 4.7% of respondents with an HMO did not have HTN knowledge scores.

Table 9: Frequencies and Percentages for HTN Knowledge Missing and Non-Missing Values by HMO Status

HMO Status	No HTN Score		Has HTN Score	
	Frequency	Percentage	Frequency	Percentage
No HMO	43	29.3	104	70.7
Has HMO	4	4.7	81	95.3

Note. Absence or presence of HTN Knowledge score varied significantly across HMO status, $\chi^2(1) = 20.09, p = .001$.

Expectations of Care

As shown in Table 10, Cronbach's alpha for the Expectations of Care subscale, Prevention of Fatal Outcomes, was .91. The highest possible score was five; the mean score was 2.30 (SD=.94), thus indicating that the respondents had negative expectations about preventing fatal outcomes when they took their blood pressure medications.

Cronbach's alpha for the Outcome Expectations for Non-adherence to Lifestyle Behaviors subscale was acceptable at .86. The highest possible score was five; the mean score was 1.19 (SD = .86). Therefore, the respondents did not believe that they should have fewer intakes of salt and fat or that they should exercise if they took their blood pressure medications.

Cronbach's alpha for the Expectations of Physicians subscale was acceptable at .80 (SD=.86). The highest possible score was five; the mean score was 3.31 (SD = .56) thus indicating that the respondents were relatively neutral toward what they expected from their physicians.

Cronbach's alpha for the Positive Outcomes subscale was acceptable at .73. The highest possible score was five; the mean score was 2.87 (SD = .62). Therefore, respondents were

relatively neutral about their chances of staying healthy if they took their blood pressure medications.

Table 10: Descriptive Statistics and Cronbach's Alpha for the Study Measures

Variable	<i>N</i>	Alpha	<i>M</i>	<i>SD</i>
Hypertension knowledge	322	.46	.91	.09
Social support	387	.96	3.83	.94
Emotional/informational	387	.95	3.78	1.00
Tangible	387	.94	3.75	1.18
Affectionate	387	.92	4.09	1.09
Positive social interaction	387	.94	3.82	1.15
Outcome expectations				
Prevention of fatal outcomes	386	.91	2.30	.94
Non-adherence to lifestyle behaviors	385	.86	1.19	.86
Expectation of Physicians	386	.80	3.31	.56
Positive outcomes	387	.73	2.87	.62

Social Support Survey

Social support was measured by a series of 19 items that measured support in four categories: emotional/informational, tangible, affectionate, and positive social interaction. As shown in table 10, Cronbach's alpha for the overall social support measure was high at .96. The highest score was five; the mean support was 3.83 ($SD = .96$). Therefore, the sample of respondents indicated that they had moderate social support in place. Cronbach's alpha for the emotional/informational subscale was high at .95. The highest possible score was five; the mean

score was 3.78 (SD = 1.00). Thus, the respondents felt they had adequate emotional support. Cronbach's alpha for the Tangible subscale was high at .94. The highest possible score was five; the mean score was 3.75 (SD = 1.18). Therefore, the respondents felt they had adequate tangible support. Cronbach's alpha for the Affectionate subscale was high at .92. The highest possible score was five; the mean score was 4.09 (SD = 1.09) thus indicating that the respondents had relatively high affectionate support. Cronbach's alpha for the positive Social Interaction subscale was high at .94. The highest possible score was five, the mean score was 3.82 (SD = 1.15). Thus, the respondents felt they had adequate support through positive interactions.

Adherence to Prescribed Medication

Adherence to Prescribed medication is the dependent variable, which is the fourth major construct in the conceptual model that guides this study. There were four items measuring adherence; thus, the highest possible score was four. The continuous measure of adherence was then re-coded into a dichotomous categorical measure. Respondents whose scores were between zero and two were categorized into the non-adherent group; respondents who scored three and above were categorized into the adherent group. This dichotomous categorical variable of adherence was used in subsequent procedures.

Results for Hypotheses Tests

This section of the chapter will present the results pertaining to the tests of the study's hypotheses. Prior to conducting the logistic regression procedures between the independent variables (i.e., hypertension knowledge, social support, and expectations of care) and the dependent variable (i.e., adherence to prescribed medications), adherence to prescribed medications was regressed on the control variables (i.e., age, gender, marital status, nativity status, education, employment status, income, and insurance status). Only the control variables

that significantly or marginally predicted adherence to medication were included in the subsequent procedures. The regression findings summarized in Table 11 showed that only age significantly predicted the odds of adherence to medication (OR= 1.07, $p=.001$); the older the respondents were, the more likely it was that they would adhere to their blood pressure medication. Since age significantly predicted the odds of adherence to medication, it was included as a control variable in subsequent hypotheses tests.

First Hypothesis

It was hypothesized that hypertension knowledge would significantly predict the likelihood of adherence to prescribed medication, before and after controlling for certain socio-demographic factors. Logistic regression procedures were conducted to test this hypothesis.

When age was not controlled for, HTN knowledge marginally predicted the likelihood of adherence to prescribed medication (OR=1.59, $p =.081$). As presented in Table 11, after controlling for age, hypertension knowledge did not significantly predict the likelihood of adherence to blood pressure medication (OR = 1.22, $p = .469$). Since hypertension knowledge only marginally predicted adherence to medication before controlling for age and did not significantly predict adherence to medication after controlling for age, thus, the first hypothesis was not supported.

Table 11: Logistic Regression Results for the Control Variables and Adherence to Medication Model (N = 168)

Variable	B	Odds Ratio (95% CI)
Age	.07 ***	1.07 (1.03, 1.11)
Males vs. females	-.17	.85 (.35, 2.04)
Never married vs. married	.20	1.22 (.42, 3.53)
Never married vs. divorced/separated	-.13	.88 (.34, 2.28)
Never married vs. widowed	.47	1.60 (.36, 7.06)
Born in US vs. born in other country	.46	1.59 (.65, 3.91)
Less than high school vs. some college	.61	1.85 (.81, 4.21)
Less than high school vs. associates or more	.99	2.68 (.73, 9.87)
Unemployed vs. employed	-.18	.84 (.37, 1.90)
No insurance vs. has insurance	-.55	.58 (.18, 1.87)

Note. Overall model $\chi^2(10) = 20.30, p = .027$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 12: Logistic Regression Results for Age, Hypertension Knowledge, and Adherence to Medication Model (N = 316)

Variable	B	Odds Ratio (95% CI)
Age	.04 ***	1.05 (1.02, 1.07)
Less than perfect vs. perfect HTN score	.20	1.22 (.71, 2.11)

Note. Overall model $\chi^2(2) = 19.57, p = .001$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Second Hypothesis

It was hypothesized that outcome expectations would significantly predict the likelihood of adherence to prescribed medication, before and after controlling for certain socio-demographic factors. Logistic regression procedures were conducted to test this hypothesis. Without controlling for age, only the fourth factor, Positive Outcomes, significantly predicted the likelihood of adherence to blood pressure medication (OR = 1.73, $p = .008$). Thus, the more respondents believed that taking their medications would lead to positive outcomes; the greater was the probability that they would take their blood pressure medications.

As shown in Table 13, when controlling for age, Positive Outcomes still significantly predicted the likelihood of adherence to blood pressure medication (OR = 1.56, CI=1.03, 2.37, $p = .036$). Since Positive Outcomes predicted adherence to medication before and after controlling for age, the second hypothesis was supported.

Table 13: Logistic Regression Results for Age, Outcome Expectations, and Adherence to Medication Model (N = 379)

Variable	B	Odds Ratio (95% CI)
Age	.05 ***	1.05 (1.03, 1.08)
Prevention of fatal outcomes	.04	1.04 (.79, 1.37)
Non-adherence of non-medical options	-.55	.58 (.30, 1.11)
Dependence on Physician	.05	1.05 (.67, 1.63)
Positive outcomes	.45 *	1.56 (1.03, 2.37)

Note. Overall model $\chi^2(5) = 35.97, p = .001$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Third Hypothesis

It was hypothesized that social support would significantly predict the likelihood of adherence to prescribed medication, before and after controlling for certain socio-demographic factors. Logistic regression procedures were conducted to test this hypothesis.

Prior to testing the third hypothesis, Pearson correlations were conducted to examine the 4 subscales of the social support measure. The four subscales were highly correlated with each other (e.g. Pearson correlations ranged from .58 to .71). Thus, the four subscales were collapsed and only the mean social support score was used to test the relationship between social support and adherence to blood pressure medication.

Without controlling for age, social support significantly predicted the likelihood of adherence to blood pressure medication (OR = 2.03, $p = .006$). After controlling for age, social support still significantly predicted the likelihood of adherence to blood pressure medication (OR= 1.99, $p = .010$). Given that social support predicted adherence to medication before and after controlling for age, the third hypothesis was supported, (Presented in Table 14).

Table 14: Logistic Regression Results for Age, Social Support, and Adherence to Medication Model (N = 381)

Variable	B	Odds Ratio (95% CI)
Age	.05 ***	1.05 (1.03, 1.08)
Social support	.69 **	1.99 (1.18, 3.38)

Note. Overall model $\chi^2(2) = 33.20, p = .001$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Given that social support predicted adherence to medication before and after controlling for age, the third hypothesis was supported.

Fourth Hypothesis

Hypothesis 4a. It was hypothesized that the association between hypertension knowledge and adherence to prescribed medications would be stronger among those younger than 60 years old, female, and highly educated than among their counterparts aged 60 years and older, male, and less educated. A multivariate logistic regression procedure was conducted to test this hypothesis. The findings in Table 15 reveal that the association between hypertension knowledge and adherence to prescribed medications was not moderated by age (OR = .67, $p = .507$), level of education (OR = 1.27, $p = .695$), and gender (OR = 1.65, $p = .450$). Given that none of the variables moderated the relationship between hypertension knowledge and adherence to medications, the fourth hypothesis (part A) was not supported.

Table 15 : Logistic Regression Results for the Relationship between Hypertension Knowledge and Adherence to Medications across Levels of Demographic Variables (N = 288)

Variable	B	Odds Ratio (95% CI)
Hypertension knowledge	.00	1.00 (.28, 3.64)
Age	.93 ***	2.54 (1.27, 5.09)
Education	-.38	.69 (.37, 1.29)
Nativity status	-.44	.64 (.29, 1.45)
Gender	-.24	.79 (.36, 1.72)
Hypertension knowledge x age	-.40	.67 (.21, 2.18)
Hypertension knowledge x education	.24	1.27 (.38, 4.25)
Hypertension knowledge x nativity status	-.01	.99 (.29, 3.42)
Hypertension knowledge x gender	.50	1.65 (.45, 6.01)

Note. Overall model $\chi^2(9) = 13.63, p = .136$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Hypothesis 4b. It was hypothesized that the association between social support and adherence to prescribed medications would be stronger among those older than 45 years, men and highly educated than among their counter parts aged 45 years and younger, with less education. To examine this hypothesis a multivariate regression procedure was conducted.

The findings in Table 16 show that the association between social support and adherence to prescribed medications was not moderated by age (OR = .73, $p = .624$), and level of education (OR = .78, $p = .691$). However, the association between social support and adherence to prescribed medications varied across gender groups (OR = 5.52, $p = .011$). In particular, within

the sample of males, there was no relationship between social support and adherence to prescribed medication (OR = .62, $p = .364$). Within the sample of females, there was a relationship between social support and adherence to prescribed medication (OR = 2.94, $p = .001$); the more social support female respondents received, the greater was the probability that they would adhere to their medication routine. Although gender moderated the association between social support and adherence to prescribed medications, the pattern was counter to what was predicted, e.g. that the relationship would be stronger for men than for women. Therefore, the fourth hypothesis (part B) was not supported.

Table 16 Logistic Regression Results for the Relationship between Social Support and Adherence to Medications across Levels of Demographic Variables (N = 288)

Variable	B	Odds Ratio (95% CI)
Social support	-.22	.80 (.22, 2.86)
Age	.92 ***	2.51 (1.47, 4.29)
Education	-.44	.64 (.38, 1.08)
Nativity status	.01	1.01 (.57, 1.78)
Gender	-.18	.83 (.47, 1.49)
Social support x age	-.31	.73 (.21, 2.55)
Social support x education	-.24	.78 (.24, 2.61)
Social support x nativity status	-.17	.85 (.24, 2.99)
Social support x gender	1.71 *	5.52 (1.47, 20.73)

Note. Overall model $\chi^2(9) = 34.11, p = .001$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Fifth Hypothesis

H5. It was hypothesized that the associations among the focal stimuli (HTN knowledge, expectation of care, social support) and contextual stimuli (age, gender, marital status, nativity status, education, employment status, income, and insurance) positively influenced the role function (adherence to medication) (A proposition of the Roy Adaptation Model).

The findings in Appendix E (not all variables listed) showed among the contextual variables, only age was significantly associated with adherence. Thus, only age was used in the subsequent multivariate procedures. Findings indicated that the proposition was not fully supported. Although only one focal variable, expectation of positive outcomes, was significantly associated with adherence, all the focal variables were included in subsequent multivariate procedures testing the hypotheses.

As presented in Appendix F, the change in chi-square between the model with only the contextual variable of age and the model with the contextual and focal variables was statistically significant, $\Delta \chi^2(6) = 13.65, p = .034$. Therefore, the contextual stimuli did significantly predict the likelihood of adhering to medication procedures. In particular, social support positively predicted adherence; for every increase in one unit of social support, the likelihood that participants adhered to their medication increased by 1.84. As presented in Appendix F, Expectation of Positive Outcomes also positively predicted adherence; for every increase in one unit of Expectations of Positive Outcomes, the odds that participants adhered to their medication increased by 1.59. HTN knowledge, a focal stimulus was not significant, indicating that the proposition was not fully supported.

Summary

This study used a cross sectional methodology to evaluate the relationship between Hypertension knowledge, expectations of care, social support and adherence to prescribed medication in 387 individuals with uncontrolled blood pressure. Data were used from the CAATCH study of self-reported African Americans from the New York City Metropolitan area. Data were provided through self-reported instruments that measured hypertension knowledge, expectations of care, social support and adherence to prescribed medications and a demographic questionnaire.

The majority of the sample participants consisted of female adults. A large percentage attended high school or a technical school, had less than high school, and some college, respectively. The majority had Medicaid but no HMO insurance or private insurance. The majority had annual household income of \$40,000 or less.

Data for analysis were screened using appropriate statistical tests to evaluate for normal distribution and variance. Records that had missing values or incomplete responses were excluded from the analyses via listwise deletion (Miller, 2005). Transformation of data as well as recoding of variables was used where necessary to prepare the data for quantitative analyses.

The appropriate statistical methods were used to test the study aims. Univariate and multivariate analyses were used. Regression analyses were used to determine the relationship between the main independent variables and the dependent variable, adherence to medication, while controlling for the covariates.

HTN knowledge was not significantly associated with adherence. However, expectation of care and social support were significantly associated with adherence, while controlling the

significant covariate, age. The other covariates were not predictors of adherence to medication so they were not included in the model.

Chapter V

Discussion

The purpose of this study was to investigate the relations among hypertension knowledge, expectation of care, social support and adherence to prescribed medications in African Americans. This chapter presents the discussion of: (a) findings related to the research hypotheses and analyses, (b) strengths and limitation of the research, (d) ancillary data findings, (e) relational concepts of the Roy Adaptation model (2009), (f) conclusions, the implications and recommendations for health care outcomes and further research.

Findings Related to the Research Hypotheses and Analyses

In this study of 387 African Americans with uncontrolled blood pressure, hypertension knowledge was not found to be a predictor of adherence to medications while controlling for the socioeconomic covariates. Expectation of care was found to predict the likelihood of adherence to blood pressure with and without controlling for socioeconomic covariates. Social support was found to be a predictor of adherence to medications with and without controlling for age. This study was the first that looked at these independent variables in the context of medication adherence within the hypertensive African American population.

First Hypothesis

It was hypothesized that hypertension knowledge would significantly predict the likelihood of adherence to prescribed medication, before and after controlling for certain socio-demographic factors. When age was not controlled for, HTN knowledge marginally predicted the likelihood of adherence to prescribed medication. After controlling for age, hypertension knowledge did not significantly predict the likelihood of adherence to blood pressure medication;

through multivariate analyses the relationship between HTN knowledge and adherence was examined.

Prior research that investigated the relationship of HTN knowledge and adherence to medication found mixed results. Studies by Hashmi, Afridi, Abbas, Sajwani, Saleheen, ... et al., 2007; Karaeren, et al., 2009; Morgado, et al., 2010; Morisky, et al., 2008 supported this relationship and those by Hyre, et al., 2007; Kressin, et al., 2007, did not support this relationship. These studies included hypertensive individuals.

In a cross sectional study of 227 hypertensive participants, researchers found that hypertension knowledge, namely, knowing the duration of the medicine (OR= 6.822; 95% CI: 1.478-31.241, $p=0.075$), the cause of the hypertension (OR=3.447; 95% CI:1.889-6.290, $p=0.037$) and the target level of blood pressure (OR= 12.859; 95% CI:5.045-32.640, $p<0.001$) significantly increased adherence rates using logistic regression analysis (Karaeren, et.al., 2009). Knowledge was measured by seven questions and adherence was measured by the self-assessment method. The questionnaires used to measure hypertension knowledge and adherence differed from those of this study.

Further, in a cross sectional study of 460 participants, researchers found that greater hypertension awareness was associated with higher adherence to medication ($P<0.001$) (Hashmi, et al., 2007). Through univariate and multivariate logistic regression, it was showed that those participants who considered every dose of medication to affect blood pressure had a higher adherence rate compared to those who did not. Adherence was measured by the Morisky Medication Adherence Scale, similar to this study.

In another cross sectional study of 197 participants from a hypertension outpatient clinic, hypertension knowledge and adherence rates were significantly associated. Through the use of

logistic regression analysis, knowledge about target blood pressure values ($p < 0.001$), the presence of drug side effects ($p < 0.002$), measuring blood pressure regularly ($p < 0.015$), knowledge of drug indications ($p < 0.021$), knowledge of hypertension risks ($p < 0.026$), and adherence to medication were significantly influenced (Morgado, et al., 2010). Adherence to medication was measured with the Morisky Medication adherence scale. Other similarities with this current study include participants with high risk for poor blood pressure control. Nonetheless, the scale that measured hypertension knowledge differed from the present study and population was not African American, which could explain this study's lack of significance. Despite adequate HTN knowledge of this study's participants, knowledge did not translate into adherence behavior.

A randomized experimental pretest and posttest study design of 1367 African American participants with hypertension, researchers found that hypertension knowledge was significantly (OR = 1.15; 95% CI: 1.03-1.29, $p < .05$) associated with adherence to medication using multivariate logistic regression analysis. Adherence to medication was measured by the Morisky 8-item adherence scale and knowledge was measured by a 6 item index. (Morisky, et al., 2008).

Studies that supported findings in this study were two studies involving a large percentage of African American participants showed no significant association between hypertension knowledge and adherence to medications (Hyre, et al., 2007; Kressin, et al., 2006). In the first telephone survey study with 295 hypertensive participants from an urban setting, there was no significant association between hypertension knowledge and adherence to medication, using a multinomial logistic regression analysis. Medication adherence was measured using the 8 item Morisky Medication Adherence scale, similar to this study (Hyre, et al., 2007).

In the second study, researchers from 3 Veteran Affairs medical centers found that with hypertensive African Americans there was a significantly negative association with knowledge and adherence to medications ($p=.006$) by using multivariate regression analysis. Although knowledge is important for behavioral change in chronic conditions, recent review studies demonstrated the complexity of adherence and suggest a multifaceted approach. For example, assessing other factors that influence behavior, such as patients' perceptions, beliefs, self-efficacy awareness were recommended (Ogedegbe, et al., 2004).

The inconsistent findings, including this study's findings could be related to self-report of adherence as opposed to a more objective measure of medication adherence. Social desirability is a risk of self-reporting method and can bias findings. Self-report is a common method used for adherence. However, having two types of measurement strategies, such as self-report and objective medication monitoring could compensate for the limitations of the other method (Dimatteo, 2004).

Another factor that could explain the lack of association between hypertension knowledge and adherence in this study's population of hypertensive African Americans is that knowledge alone is not adequate for change in health behavior. Instead, researchers found that individuals, who were engaged in positive thoughts of self-integrity, had higher medication adherence at 12 months as compared to individuals with knowledge alone. (Ogedegbe, et al., 2012).

Because adherence behavior is complex, cognitive and behavioral predictors are necessary when evaluating adherence. Though hypertension knowledge is necessary for behavioral change, knowledge alone does not translate into adherence. This could explain why there are such mixed findings in HTN knowledge studies. Most recent review of the literature

demonstrated that there are varied factors why individuals adhere to taking their medications. As previously discussed, researchers used behavioral models such as self-regulatory model, health belief model, the theory of reasoned action, and self-efficacy theory to explain adherence in the context of HTN. Adherence behaviors may be influenced by various factors, such as, individuals' perceptions about the medication, beliefs about prescribed medications or the confidence in their ability to execute the behavior of adhering.

Second Hypothesis

It was hypothesized that outcome expectations would significantly predict the likelihood of adherence to prescribed medication, before and after controlling for certain socio-demographic factors. Expectation of care significantly predicted the likelihood of adherence to medications while controlling for age. This was done using multivariate logistic regressions analysis.

There is a paucity of research examining the relationship between expectations of care and adherence to medications in the AA population. However, findings from this limited number of studies supported the relationship between expectation of care and adherence (Bell, Kravitz, Thom, Krupat, & Azari, 2002; Gascon, Sanchez-Ortuno, Bartolome, L., Skidmore, Saturno, 2003; Ogedegbe, et al., 2004).

In a large scale investigation of patient and physician interaction, there were 1,929 patients and 45 physicians participants. Patients were pre and post screened on their expectations about their physician care prior to their medical visits. Physicians were assessed on their satisfaction with the encounter. Through a multivariate analysis, researchers found that patients' intentions' to adhere to physicians' advice were strongly associated with having no unmet expectation (coeff: -0.305; p= .056) (Bell, et al., 2002). Physicians expressed frustration

with non-fulfillment of patients' expectations. Unmet expectations adversely affected both the physician and patients. Through logistic regressions, significant associations were found for patients' age ($p=.003$). Unmet expectations were reported by younger patients. For this study, age was significant in the multivariate logistic regression model (OR= 1.05 (CI 1.03, 1.08, $p<.001$). Other covariates such as education, gender, household income, marital status, or ethnicity were not significant, similar to this study.

In addition, expectations of care and adherence and adherence to anti-hypertension medication in African Americans seemed to occur together in interviews. In a qualitative study using in-depth interviews for 93 participants, findings found that they expected to participate in their hypertension treatment, such as adapting to a healthy lifestyle (Ogedegbe, et al., 2004). Participants expected their medications to lower their blood pressure, prevent stroke, kidney failure, and stroke. However, despite these expectations, 38% did not expect to take their medications for life and 23% only would take medications with symptoms. The current quantitative study found significance when respondents believed that taking their medications would lead to positive outcomes, such as avoiding a stroke and a heart attack (OR= 1.73, $p=.008$). Thus, patients' expectations of care are an important patient related independent variable that should be assessed further in this population.

Third Hypothesis

It was hypothesized that social support would significantly predict the likelihood of adherence to prescribed medication, before and after controlling for certain socio-demographic factors. Social support was found to be a predictor of adherence to medication before and after controlling for patients' age. The relationship between social support and adherence is supported by multivariate studies, all of which controlled for patient factors such as age, gender, education,

and others (DiMatteo, 2004; Krousel-Wood, Islam, Muntner, Holt, Joyce,...& Fruhlich, 2010; Morisky, et al., 2008).

In the Medical Outcomes Study Social Support Index, cross sectional and longitudinal evaluations were conducted (Krousel-Wood, et, al., 2010). The cohort consisted of 2,180 older adults with hypertension who were randomly selected to assess social support and medication adherence using self- report scales. A large percentage of the participants were AA. The Morsiky 8 items scale was used for adherence and the Medical Outcomes Study Social Support Index scale was used for social support. Findings indicated that low social support was associated with low anti-hypertensive medication adherence. The current study used the same scale to measure social support and the 4 items Morisky adherence scale.

Numerous studies found a strong overall correlation between adherence and social support. For example, in a meta-analyses of 122 studies from 1948-2001, 29 of those studies examine practical social support and adherence. Results showed significant relationships between social support and adherence to medications (DiMatteo, 2004). Statistical findings showed correlations range from $-.22$ to $.75$, median $(.27)$ and the unweighted mean effect size r $(.31)$, indicating close magnitude, thus significant in the random effects model.

In addition, a randomized experimental pretest and posttest study of 1,367 patients examined the relationships of psychosocial factors, particularly, social support and levels of adherence to medication (Morisky, et al., 2008). The participants were 76.5 % blacks, men 40.8% and women 59.2%. The self-report 8-item medication adherence scale, with a Cronbach's alpha of 0.83. Results showed participants with family member social support had significantly high levels of adherence to medication. Similar to this study, women were the majority of the

participants and the results showed a significant relationship with social support and adherence to medication.

Fourth Hypothesis

Hypothesis 4a. It was hypothesized that the association between hypertension knowledge and adherence to prescribed medications would be stronger among those younger than 60 years old, female, foreign-born, and highly educated than among their counterparts aged 60 years and older, male, US-born, and less educated. The association between hypertension knowledge and adherence to prescribed medications was not moderated by age.

Associations between age and adherence to anti-hypertensive medications have been established in the literature (Charles, et al., 2003; Hyre, et al., 2007; Shea, Misra, Ehrlich, Field, & Francis, 1992; Yiannakopoulou, Papadopulos, Cokkinos, & Mountokalakis, 2005). In a large (N=5269) retrospective analysis, researchers found that African Americans rates of adherence to medications were significantly lower than whites, particularly for certain anti-hypertensive drug classes, and in the youngest age groups from 45 to 54 and 55 to 64 years of age (Charles, et al., 2003).

In an observational cross sectional study of 1000 hypertensive participants, those individuals who were under the age of 60 years old, better educated, and lived in the city were more adherent than their counterparts who were older than 60 years (Yiannakopoulou, et al., 2005). In concurrence with this study, a case control study of 202 African Americans used a multiple logistic analysis to showed that non-adherence was significantly associated with younger age (adjusted OR= 1.03, 95% CI=1.00, 1.06; p=.03) (Shea, et al., 1991).

While previous studies have found that adherence to medications varies depending on age groups, there is no indication that this phenomenon is isolated to the AA population. Age affects

adherence inconsistently therefore, it was suggested to evaluate age separately in each condition, and by the characteristics of the individual. For example, with elderly AA patients, there is an increased risk of poor adherence due to multiple co-morbidities, functional, and cognitive dysfunction (WHO, 2003). Conversely, in a Medicaid survey study of adherence to HTN medications, old age was associated with better adherence when compared with elderly aged 65 through 75 and blacks were significantly less likely than whites to achieve adherence (Monane, et al., 1996). The Medicaid study did not examine the mediating effect of the variables, so interaction was not mentioned.

Hypothesis 4b. It was hypothesized that the association between social support and adherence to prescribed medications would be stronger among those older than 45 years, men, foreign born and highly educated than among their counter parts aged 45 years and younger, US born with less education. The association between social support and adherence to prescribed medications was not moderated by age and nativity status. However, the association between social support and adherence to prescribed medications varied across gender groups. In particular, within the sample of males, there was no relationship between social support and adherence to prescribed medication. Within the sample of females, there was a relationship between social support and adherence to prescribed medication; the more social support female respondents received, the greater was the probability that they would adhere to their medications.

Associations between social support and adherence have been established in the literature. Accordingly, in a randomized experimental longitudinal study, researchers used a multivariate analysis to control for age, gender, marital status, income, educational status, and social support (Morisky, et al., 2008). Findings showed that patients with positive family member support had significantly high levels of adherence (OR=1.06, CI 1.02, 1.37, $p < .005$).

Other socio-demographic variables did not reveal statistical significance. Social support was measured by a 7- item coping scale which, differed from the social support instrument used in this study.

Social support and gender associations have been established in the reviewed studies. Gender differences in social support showed that women perceive social support from various sources, not only from close interpersonal relationships e.g. significant others, family, and friends. However, men perceive social support only from close interpersonal relationships, particularly from their spouses (Jackson, 2010; Rose, et al.,2000). Previous national survey of older people showed women having a larger network of support (Kahn & Antonucci, 1984). Social support is perceived as quantitative support, from many sources by women, which relates to qualitative support. While men perceive social support as qualitative, this is limited, mainly to support from their spouses. This perceived quality of support relates to a person's well being. Although these men may receive other types of social support, such as functional support, from health care providers, neighbors, these men have a negative sense of well being, which may negatively adherence to medication. Thus, perceived social support by men may be a confounding variable that need to be controlled for in future studies.

Fifth Hypothesis

Hypothesis 5. It was hypothesized that the associations among focal stimuli, represented by HTN knowledge, expectation of care, social support, and the contextual stimuli, represented by age, gender, marital status, nativity status, education, employment status, income, and insurance would significantly predict the likelihood of adherence to prescribed medication. The association among expectation of care, particularly, positive outcomes and social support were found to significantly predict the likelihood of adherence to prescribed medication. However,

HTN knowledge was not a predictor of adherence. Similarly among the contextual variables, only age was significant in predicting adherence. However, among other contextual variables such as, gender, marital status, nativity status, education, employment status, income, or insurance, there was no significant predictors of adherence.

In a review of the literature, of the studies identified, this is the first study which used the Roy Adaptation Model to link these variables to adherence to medications. A mixed method study tested the proposition from the Roy Adaptation Model, which indicated that stimuli are directly related to the modes of adaptation (Fawcett, et al., 2011). In the study, perception of the birth experience and preparation for cesarean birth represented the stimuli and responses to the caesarian birth represented adaptation. Results supported the proposition that the stimuli are directly related to the modes of adaptation (Fawcett, 2003). The findings of this current study indicate that selected focal and contextual stimuli do affect adaptation. For this study, not all of the selected focal and contextual variables significantly predicted adherence.

Study Findings and Hypertension

The descriptive data in the dissertation sample was compared with the United States hypertensive patient population and the subpopulation of African Americans. Epidemiological statistics are presented with prevalence, gender and age (CDC, 2012). The estimated prevalence of hypertension among United States adults aged ≥ 18 years in 2003-2010 was 30.4% or an estimated of 66.9 million (Yoon, Gillespie, George, & Wall, 2012). The estimated prevalence of hypertension for African American men is 43% compared to women 45.7 (CDC, 2012). Both women and men are likely to be affected by this disease. However, for those individuals under the age of 45 years old, men are more affected than women. By age 65 years and older women are more affected by hypertension. This higher prevalence in women versus men was

demonstrated in this study sample where the larger percentage of the hypertensive responders wherein 74.0% - 76% of responders were women.

African American women experience a greater prevalence of coronary heart disease (7.8%) than African American men (7.1%), which is a complication from uncontrolled blood pressure (AHA, 2007; Levine, Bone, Hill, Stallings, Gelber, Barker, . . . , Clark, 2003).

Adherence to antihypertensive medications was a strong predictor of blood pressure control among African Americans (Redmond, Baer, & Hicks, 2011). A focus group study was conducted with 20 hypertensive African American women ages 35 years and older to find out what are the factors impacting adherence to high blood pressure treatment (Fongwa, et al., 2008). Results showed three categories of adherence factors: beliefs about high blood pressure, facilitators of adherence to treatment regimens, and barriers to adherence to recommended treatments. Among this group of African American women, most did not have their blood pressure <120 systolic pressure or <80 diastolic pressure. Uncontrolled blood pressure among this population is consistent with other studies (Artinian, Washington, & Templin, 2001; Chobanian, et al., 2003). The mean age (52.81, SD=10.71) of this study was higher than the focus group sample. The sample of the focus group consisted of 20 participants which were not randomized, which may not reflect the general population.

Demographic and socioeconomic characteristics such as age, race, and lack of health insurance have been associated with non-adherence to medication in previous research (Osterberg, et al. 2005; Mochari, Ferris, Adigopula, Henry, & Mosca, 2007). In a cross sectional study of 371 adults, to determine prevalence and predictors of non-adherence to blood pressure and cholesterol lowering medications, associations between participants demographics and medication non-adherence were assessed (Aggarwal & Mosca, 2010). Demographic

characteristics showed mean age, was 59 (SD= 9), 57% female, 60% were minorities. Results from a multivariate regression model, found non-adherence was associated with age <65 years (OR=0.2, 95% CI= 0.04-0.7). For this current study, respondents who were non-adherent to their blood pressure medication had a mean age of 52.81 (SD=10.72), which is similar to Aggarwal & Mosca study.

In another cross sectional study of 214 minorities, age and lack of insurance were found to be predictors of non-adherence to medication in this racial/ethnic population ((Mochari, Ferris, Adigopula, Henry, & Mosca, 2007). Individuals younger than 45 years versus age 45 or older (P=.004), not having health insurance versus having health insurance (P=.01) were predictors of non-adherence. The majority of the participants were women, 70% and almost all were racial/ethnic minorities. Some of these findings are similar to this present study. The majority of the participants were African American women, 76%. The older the respondents were, the more likely it was that they would adhere to their blood pressure medications. On the contrary, insurance versus no insurance was not a significant predictor of adherence (OR=.58, CI=.18, 1.87).

Ancillary Data Findings

In this study the hypertension knowledge questionnaire had a large amount of missing scores. Thus, chi-square analyses were conducted for missing and non-missing scores across levels of the control variables (i.e., gender, income, education, marital status, work status, and insurance status) to determine whether the pattern of missing values was random or systematic. Results showed more males (23.7%) had missing score compared to females (14.6%). There are different explanations for AA males not answering HTN knowledge questions. In a cross sectional survey conducted in the North Carolina Family Medicine Research Network (NC-FM-

RN) study basic HTN knowledge was assessed (Viera, et al., 2008). Findings showed that non-respondents to knowledge questionnaire were significant for AA males (48.2 %, CI= 40.6-55.8, $p < .001$) compared to white male respondents (32.5%, CI= 28.5-36.5). African Americans had 1.77 times odds of having lower HTN knowledge compared with white males. In addition, with lower HTN knowledge, AA had less high school education. In this study, bivariate analysis found significance with minimal number of missing HTN knowledge score, individuals who were uneducated (0%), completed a Bachelors' degree (8%) and attended some graduate school (8.3%). Research showed that the association with less education is probably related to health literacy (Williams, Baker, Parker, & Nurss, 1998). The lack of education, lower health literacy and lower HTN knowledge could be contributing factors for such varied range of missing HTN score.

Relational concepts of the Roy Adaptation Model

Roy (1984, 2009) defined adaptation as a function of the combined effect of the focal, contextual, and residual stimuli (BBARNS, 1999; Roy 2009). The Roy Adaptation model is described in Chapter 1 of this study. This study tested the proposition for the Roy Adaptation Model, which stated the focal and contextual stimuli influence responses in the modes of adaptation. One of the aims of this study was to test the validity of this proposition. The research identified the focal stimuli as HTN knowledge, expectation of care, and social support and the contextual stimuli as age, gender, marital status, nativity status, education, employment status, income, and insurance status. Adaptation was identified as adherence to antihypertensive medications. The findings indicated that in fact, expectations of care and social support were predictors of adherence to medications, yet HTN knowledge was not.

Similarly, when the contextual variables were analyzed with adherence to medication only age was significant. Although the proposition is not fully supported, the findings indicate that selected focal and contextual stimuli affect adaptation. Given the continuing evolution of nursing research and the use of more sophisticated multivariate statistics, findings from this study support the modification of the proposition. The proposed modification would result in the following revised proposition: the characteristics of the focal and contextual stimuli may vary in strength and significance in their effect in adaptation.

Nursing models and theories reflect the state of the discipline. As such, they need to be sensitive to the changes in nursing as well as to the changes in research and the state of the science. The proposed modification of the Roy Adaptation Model proposition needs further testing and substantiation.

Strengths

This study is the first cross sectional quantitative study to examine patients' expectations of their hypertension care, specifically positive outcome and its influence on adherence in African Americans. This dissertation builds on previous research in the concept of expectation of care in a hypertension population. A multivariate analysis was used to examine patients' views of their care, hypertension knowledge, social support and the influence on adherence to medication, while controlling for socio-economic covariates. Information from these analyses provided guidance for healthcare and direction for future research.

Another strength of this dissertation study was the investigation of patients' views of their illnesses and its' treatments in the context of decision making in health behavior. Research proposes that understanding patients' priorities concerning their aspect of care have a great potential for increase adherence and will be helpful in improving the quality of hypertension

care; promotes patient centered care, and influences self care (Gascon, Sanchez-Ortuno, Ilor, Skidmore, & Saturno, 2004; IOM, 2001; IOM, 2004; Osterberg & Blaschke, 2005)

Limitations

The limitations identified for this study are as follow. This study was limited to participants who were receiving care from community health centers (CHCs) in the New York City Metropolitan area for at least 6 months during the years 2004-2011. This study excluded patients who were non English speaking. The population included patients who self-identified as Black or African Americans. Additionally, this study was comprised mainly of women (76%), thus, preventing comparisons between other populations as well as the ability to generalize results beyond predominantly low income female groups, thus, affecting external validity (Portney & Watkins, 2009).

Because this study is a secondary data analysis, variables and instruments were predetermined by the parent study, which may not be the best for the present research. Even though this study only selected participants from the control group, participants from this random control trial could have been exposed to a greater amount of information pertaining to HTN control compared to other individuals who were not in similar environment. This study exclusively used self-report to measure adherence to medication, which can be affected by social desirability response bias and or possible recall bias (Polit & Beck, 2004). Participants may reply to the questions as how they think as oppose to being honest. Furthermore, it would be beneficial to include another measure scale such as the MEMS to compare adherence data.

Chapter VI

Conclusions, Implications, and Recommendations

Nurses and other health care providers play significant roles in assisting patients to improve adherence to medications applying their understanding of adherence and employing different methods to assess and intervene for problems of non-adherence (Albert, 2008; Javasinghe, 2009). The National Health Promotion and Disease for 2020 (HSS, 2008) advocates for measures to increase the number of adults with controlled blood pressure. This study showed that individuals' expectations of care, and social support were associated with statistically significant improved adherence to medication in a population of African Americans. Findings for this study are relevant for practice and research. This chapter presents the investigators' conclusions, implications for practice, research, and recommendations for future research.

Conclusions

Findings of this study suggest that expectations of care, particularly expectations of positive outcomes, and social support are potentially important predictors of adherence to antihypertensive medication. Knowledge of these adherence predictors suggests that medical clinicians, health educators, and nurses need to implement measures to assess and intervene for expectations of care and levels of social support. Results from assessments can help care providers to implement culturally appropriate interventions that will engage these patients in self-management of adherence to anti-hypertensive medications.

Nursing Implications

The study findings imply that nurses and other health providers should (a) screen patients with hypertension for barriers to adherence to anti-hypertensive medications (b) develop intensified strategies to help patient obtain adequate social support and (c) help adult African Americans who are less educated to develop realistic perceptions of expectations of their care . Nurses screening should focus on: (a) conducting initial assessments of adherence behaviors by using a formal adherence scale (b) screening for HTN knowledge especially in African American men (c) assessing all newly diagnosed hypertensive patients, (d) encouraging all hypertensive patients to always bring in their anti-hypertensive medications to their health care provider visits, (e) interventions include initiating telephone contacts through texting or phone calls about medication reminders, (f) conducting age-appropriate educational sessions on HTN knowledge for those patients who have uncontrolled blood pressure, and (g) conducting social support screening, and (h) referring to other providers as needed. Nurses in community and ambulatory settings can identify persons who have difficulty with self-management of HTN. Once these individuals have been identified, engage them through motivational interviewing about the benefits of self management of their HTN.

Nurses can assess social support as individuals perceive it and illicit from them whom the social support comes from and the importance of social support for the person at the present stage of life. It is important for both health care providers and patients to be aware of sources of social support that are available (Pender, et al., 2002). For example, for many African Americans, the church is a major aspect of their social support. Initiating quarterly teaching sessions for health care providers and nurses about cultural competencies of hypertension care

for African Americans. In addition, quarterly teaching sessions about the black church should be conducted by a health professional, in that particular church.

Strategies targeted at increasing social support can involve religious organizations. In a study of the influence of social and religious support on treatment adherence for whites, Hispanics and African American HIV patients, results showed for African Americans, spirituality and social support were influential on their adherence (Sunil & Mc Gehee, 2007). Highlighting the importance of involving religious organizations in the care of patients was shown to be positively influential on adherence. Nurses can also provide social support as well as help African Americans to identify and mobilize available social supports.

The study findings imply that nursing policies should include culturally- specific education for individual ethnic groups. Other strategies for expectation of care include actively engaging patients in assessing their treatment options and collaboratively agreeing on treatment goals and strategies to assess progress toward treatment goals. In addition, it is important to establish effective patient and provider partnerships (Heisler, 2008). Establish patient centered models of care such as the medical model. For example, this model of delivering care provides a team of providers, a health care provider, nurse, pharmacist, social worker, and other support health care workers. Patients are given access through emails, telephone to access their health care team at their convenience.

It is important to establish an initial adherence evaluation with the same adherence tool throughout the facility for all hypertensive patients. In addition, adherence scores should be documented in patients' chart or in their electronic medical records. The display of the adherence scores should be in the vital signs data sheet. In addition to the adherence score, there should be a self- efficacy scale. Each hypertensive patient should be introduced to at least one

session of motivational interviewing by a trained health care provider. The purpose of this intervention is for patients to verbalize their motivational factor (s) for adhering to medication.

Implications for Research

This study should be replicated in a sample population that is representative of the general population of hypertensive individuals. Multivariate analysis in this study showed significant differences regarding expectation of care and adherence. This study provides further evidence that a patient centered approach should be further investigated in African American populations. Research is needed to evaluate patient views of their hypertension care; thus far there have been too few studies in African American populations. Patients' expectations should be considered when initiating interventions to promote adherence. It is recommended that interventions for HTN management should be based on shared decision making and partnership between patients and providers (Thomson, Bowling, & Moss, 2001). Furthermore, when evaluating appropriate patient care, patient preferences and their values are as important as meeting professional and societal safeguards and concerns (NHSME, 1993). In addition, socio-economic factors such as age and insurance should be evaluated in studies of adherence.

Recommendations for Future Research

Research should focus on replicating the findings of this study by using a non-experimental approach in a similar hypertensive African American population. Because the parent study of this secondary analysis was a randomized controlled trial, patients from the control group may have been exposed to more educational information than the average hypertensive African American patient.

Future studies of hypertensive African American patients should use objective adherence measures to minimize social desirability. In addition, including newer measures associated with

adherence such as patient provider relationships should offer insights in future studies. Future studies should include health beliefs and behavioral concepts of adherence. In addition, future studies should be conducted using the Roy Adaptation Model proposition to evaluate adherence to medications.

Continued research should be done to further explore the influence of social support on adherence in African American men versus women in longitudinal studies. Other studies should focus on insurance status and health literacy on adherence to medication as barriers in African Americans. Further interdisciplinary research should focus on patient- related barriers to adherence to anti-hypertensive medications. With an interdisciplinary approach to adherence in African American population, combined efforts could provide comprehensive targeted interventions to improve adherence and thereby, control blood pressure.

Appendix A

Morisky Adherence to Medication Questionnaire

	QUESTION	YES	NO
1	Over the past week, have you taken your blood pressure medicine as you should on schedule?		
2	Do you ever forget to take your blood pressure medicine?		
3	Are you careless at times about taking your blood pressure medicine?		
4	When you feel better do you sometimes stop taking your blood pressure medicine?		
5	Sometimes if you feel worse when you take your blood pressure medicine, do you stop taking it?		

Appendix B

Hypertension Questionnaire

	QUESTION	TRUE	FALSE
1	High blood pressure means the same as "hypertension"		
2	High blood pressure runs in families		
3	Blood pressure goes up as a person gets older		
4	High blood pressure usually causes symptoms		
5	High blood pressure can cause a person to have a stroke		
6	High blood pressure can cause a person to have kidney problems		
7	High blood pressure can cause a person to have a heart attack		
8	High blood pressure can be treated with medicine		
9	High blood pressure cannot be cured		
10	A person who has high blood pressure should eat less salt		
11	A person who has high blood pressure should eat less fat		
12	A person who has high blood pressure should eat more fruits and vegetables		
13	Eating more fruits and vegetables can help lower blood pressure		
14	Exercise can lower a person's blood pressure		
15	Losing weight can lower a person's blood pressure		
16	Being overweight can cause high blood pressure		
17	Bad diet can cause high blood pressure		

Appendix C

Blood Pressure Outcome Expectation Questionnaire

		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	I expect my doctor to teach me how to take my blood pressure medication					
2	I expect my doctor to tell me the side effects of my blood pressure medications					
3	I expect my doctor to take me off the medication when my blood pressure is normal					
4	I expect my doctor to cut down on the dose of my blood pressure medication					
5	I expect my doctor to check my blood pressure every time I see her/him					
6	I will take my blood pressure medication as long as my doctor says I need it					
7	It is up to me to take my blood pressure medication as directed by my doctor					
8	My high blood pressure will go away whether I take my medications or not					
9	If I take my blood pressure medication right, I will not have to take it for the rest of my life					
10	I expect the medication to control my high blood pressure					
11	I expect the medication to lower my high blood pressure					
12	I will not have a stroke if I take my blood pressure medication					
13	I will not have a heart attack if I take my blood pressure medication					
14	I will not have kidney failure if I take my blood pressure medication					
15	I do not have to lose weight or exercise as long as I take my blood pressure medication					
16	I do not have to reduce the amount of salt in my diet as long as I take my blood pressure medication					
17	I do not have to reduce the amount of fat in my diet as long as I take my blood pressure medication					
18	I expect to take my blood pressure					

	medication for the rest of my life					
19	I expect to take my blood pressure medication only when I have symptoms					
20	The medication I am taking will cure my high blood pressure					
21	I expect the medication to help me reduce stress					
22	The blood pressure medication will help me live longer					
23	The blood pressure medication should improve my health					
24	I will feel better if I take my blood pressure medication					
25	I will not need the medication anymore when my blood pressure is normal					

Appropriate: 1, 2, 5, 6, 7, 10, 11, 18, and 23

Inappropriate: 3, 8, 9, 15, 16, 17, 19, 20, 21, and 25

Expectation may be appropriate: 4, 12, 13, 14, and 24

Appendix D

MOS (Social Support Survey)

	None of the time	A little of the time	Some of the time	Most of the time	All of the time
Emotional/informational support					
Someone you can count on to listen to you when you need to talk	1	2	3	4	5
Someone to give you information to help you understand a situation	1	2	3	4	5
Someone to give you good advice about a crisis	1	2	3	4	5
Someone to confide in or talk to about yourself or your problems	1	2	3	4	5
Someone whose advice you really want	1	2	3	4	5
Someone to share your most private worries and fears with	1	2	3	4	5
Someone to turn to for suggestions about how to deal with a personal problem	1	2	3	4	5
Someone who understands your problems	1	2	3	4	5
Tangible support					
Someone to help you if you were confined to bed	1	2	3	4	5
Someone to take you to the doctor if you needed it	1	2	3	4	5
Someone to prepare your meals if you were unable to do it yourself	1	2	3	4	5
Someone to help with daily chores if you were sick	1	2	3	4	5

Positive social interaction					
Someone to have a good time with	1	2	3	4	5
Someone to get together with for relaxation	1	2	3	4	5
Someone to do something enjoyable with	1	2	3	4	5
Additional item					
Someone to do things with to help you get your mind off things	1	2	3	4	5

Affectionate support					
Someone who shows you love and affection	1	2	3	4	5
Someone to love and make you feel wanted	1	2	3	4	5
Someone who hugs you	1	2	3	4	5

Appendix E

Spearman Rho Correlations between the Contextual, Focal, and Role Function Variables

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Adherence											
2. Age	.25***										
3. Gender	-.04	.06									
4. Marital status	.02	.41***	.08								
5. Nativity status	.02	.11	.02	.05							
6. Level of education	.03	-.10	.00	-.02	-.15**						
7. Hypertension knowledge	.10	.21***	-.05	.04	.20***	-.22***					
8. Social support	.13	.04	.01	.05	-.03	-.03	.05				
9. Fatal outcomes	.04	.10	-.08	-.01	.21***	-.13*	.16**	.14**			
10. Lifestyle behaviors	-.06	.07	-.05	.07	-.05	-.15**	.08	-.06	.14**		
11. Expectations of doctors	.02	-.07	.04	-.02	-.10	.11*	-.07	.10*	.03	-.29***	
12. Positive outcomes	.17***	.11	-.06	.05	.09	-.04	.17**	.17**	.33***	-.05	.26***

* $p < .05$. ** $p < .01$. *** $p < .001$.

Appendix F

Logistic Regression Results for the Role Function Model of Adherence (N = 314)

Variable	B	Odds Ratio (95% CI)	
Step 1			
Age	.05 ***	1.05	(1.02, 1.07)
Step 2			
Age	.04 ***	1.05	(1.02, 2.05)
HTN knowledge	.15	1.16	(.66, 2.05)
Social support	.61 *	1.84	(1.03, 3.28)
Prevention of fatal outcomes	-.05	.95	(.71, 1.28)
Expectations of lifestyle behaviors	-.21	.81	(.60, 1.09)
Expectations of Physician	.08	1.09	(.66, 1.79)
Expectations of positive outcomes	.47 *	1.59	(1.10, 2.52)

Note. Step 1 $\chi^2(1) = 18.98, p = .001$; Nagelkerke $R^2 = .082$. Step 2 $\chi^2(7) = 32.63, p = .001$;

Nagelkerke $R^2 = .138$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Appendix G



Olugbenga Ogedegbe, MD, MPH 423 227 E 30th St, 6th Floor, Room 634, New York, NY 10016
Associate Professor of Medicine olugbenga.ogedegbe@nyumc.org
Director, Center for Healthful Behavior Change Telephone: (212) 263-4183
Division of General Internal Medicine Facsimile: (212) 263-4201

August 17, 2011

The Graduate Center, The City University of New York
C/O Office of Human Subjects
365 5th Avenue
New York, New York

Attention: Kay Powell

Dear Ms Powell,

Please note that Ms. Andrea Barnes-Grant, The Graduate Center Student, has the permission of Dr. Gbenga Ogedegbe, MD, MS, MPH of the New York University School of Medicine to use the de-identified data sets for the Counseling of African Americans to Control Hypertension (CAATCH) study R#08-159). Ms. Barnes-Grant will utilize the dataset for her study "Role expectation, hypertension knowledge, demographic factors on adherence to blood pressure treatments".

Ms. Barnes-Grant has completed the CITI and NYU research trainings and has up to date certifications. She has participated in research and is knowledgeable about the process. Ms. Barnes-Grant will have full access to this de-identified and anonymized dataset where all information will be completely confidential. She is working under Professor Keville Frederickson, who has also completed all of the certification through CITI to conduct and serve as sponsor for research. Ms Barnes-Grant will share the results of her study with Dr. Gbenga Ogedegbe as well as any observations that may be critical to the original study.

If there are any questions, please contact my office, 212-263-4280.

Sincerely,

A handwritten signature in black ink, appearing to read "Ogedegbe".

Olugbenga Ogedegbe, MD, MPH, FACP, FASH
Associate Professor of Medicine
Director, Center for Healthful Behavior Change

Appendix H


**Institutional Review Board
NYU School of Medicine**

Veteran's Administration Hospital
Physical Address: 423 East 23rd Street | 10th Floor, West Wing | NY, NY 10010
Mailing Address: 550 1st Avenue | #VET 10th Floor, West Wing | NY, NY 10016


Continuation/Annual Report: Approved
03-Feb-2012

A Multi-Level Approach to Hypertension Control in African Americans	
Principal Investigator	Dr. Ogedegbe, Olugbenga G.
Phone	212.263.4281
R#	08-159
Location(s) Used	OTHER (specified in Overview)
Review Date	03-Feb-2012
Sponsor	NIH (National Institutes of Health)~
Review Type	Expedited [9] Continuation/Annual Report
Submitted	20-Jan-2012
Email	Olugbenga.Ogedegbe@nyumc.org
Perf. Period	03-Feb-2012 - 02-Feb-2013
Board/Meeting	Board B on 21-Feb-2012
Subjects	1287 (total) 1287 (approved)

The New York University School of Medicine's Institutional Review Board (IRB) is in receipt of your latest submission for the above-referenced study. The study has been granted Expedited review in accordance with 45 CFR 46.110:

Continuing review of research, not conducted under an investigational device exemption where categories two (2) through eight (8) do not apply but the IRB has determined and documented at a convened meeting that the research involves no greater than minimal risk and no additional risks have been identified.

The submission was reviewed by the IRB on 03-Feb-2012 and the current IRB Status is: Approved.

The following document is approved for use:

Protocol version date 02/01/2012

Study is closed to new enrollment

RE: R#08-159
Elan Czeisler
Director, Institutional Review Board (IRB)
OHRP #FWA00004952

03-Feb-2012

Notes:

- You must submit all changes to this study (e.g., protocol, recruitment materials, consent forms, etc.) in writing to the IRB for review and approval prior to initiation of the change(s), except where necessary to eliminate apparent immediate hazards to the subject(s). Changes made to eliminate apparent immediate hazards to subjects must be reported to the IRB within 24 hours.
- You must report all adverse and/or unanticipated event(s) that occur during the course of this study to IRB in writing in accordance with IRB Policy.
- Use only IRB-approved copies of your consent form(s), questionnaire(s), letter(s), advertisement(s), etc. in your study. Do not use expired consent forms.
- You must inform all research staff listed on this study of changes or adverse events which occur.
- IRB's approval is valid until the end date of the performance period indicated above. A reminder for renewal should be e-mailed to you from the IRB 90, 60 and 30 days before this study's approval is scheduled to expire. However, you are responsible for submitting all renewal materials at least eight weeks before expiration regardless of whether or not you receive a reminder notice.
- All IRB policy documents can be found on our website: <http://www.irb.nyu.edu>
- Prior to initiating an IRB-approved study, you must receive written approval from an authorized representative for each site where your study will take place. Key contacts are:
 - Bellevue Hospital (Bellevue Hospital Center Research Coordinators) Anand Veeraraaj, 212-562-4176; Santos Rivera, 212-562-7075; Juan Monserrate, 212-562-4904
 - CTSI - Clinical and Translational Science Institute, NYU School of Medicine (formerly General Clinical Research Center (GCRC)), Hal Rosenblatt, Research Grants Coordinator, 212-263-7900; 212-263-8040.
 - NYU Hospital Center (Tisch Hospital/Rusk Institute/Co-op Care/HJD/Cancer Center) approvals are handled for you automatically by the Office of Clinical Trials

Please Note: Prior to commencement of any research related activities at BHC as a site you MUST receive BHC and HHC approval. For any questions related to research at BHC contact their research office at 212-562-4176 (see above).

The IRB may terminate studies that are not in compliance with NYU Medical Center/School of Medicine Policies & Procedures and the requirements of the Institution's Federal Wide Assurance with the Federal Government. Please direct all IRB questions, correspondence and forms (e.g., continuing reviews, amendments, adverse events, etc.) to the IRB Main Office at (phone) 212-263-4110, (fax) 212-263-4147 or email IRB-info@nyumc.org.

New York University School of Medicine's Institutional Review Board
550 First Avenue | #VET 10th Floor, West Wing | New York, NY 10016
phone 212-263-4110 | fax 212-263-4147 | email IRB-info@nyumc.org | web <http://irb.med.nyu.edu>
The NYU SoM IRB operates in accordance with Good Clinical Practices (GCP) and applicable laws and regulations.

Appendix I


**Institutional Review Board
NYU School of Medicine**

Veteran's Administration Hospital
Physical Address: 423 East 23rd Street | 10th Floor, West Wing | NY, NY 10010
Mailing Address: 550 1st Avenue | #VET 10th Floor, West Wing | NY, NY 10016


Amendment (Personnel or Site Change): Approved
09-Aug-2011

A Multi-Level Approach to Hypertension Control in African Americans	
Principal Investigator	Dr. Ogedegbe, Olugbenga G.
Review Type	Expedited <input type="checkbox"/> Amendment (Personnel or Site Change)
Submitted	09-Aug-2011
Phone	212.263.4281
Email	Olugbenga.Ogedegbe@nyumc.org
R#	08-159
Perf. Period	-
Location(s) Used	OTHER (specified in Overview)
Review Date	09-Aug-2011
Board/Meeting	Board B on 20-Sep-2011
Sponsor	NIH (National Institutes of Health) -
Subjects	1058 (total) 1058 (approved)

The New York University School of Medicine's Institutional Review Board (IRB) is in receipt of your latest submission for the above-referenced study. The submission was reviewed by the IRB on 09-Aug-2011 and the current IRB Status is: Approved.

The following personnel change has been noted:

Adding Andre Barnes-Grant as personnel

RE: R#08-159
Elan Czeisler
Director, Institutional Review Board (IRB)

09-Aug-2011

OHRP #FWA00004952

Notes:

1. You must submit all changes to this study (e.g., protocol, recruitment materials, consent forms, etc.) in writing to the IRB for review and approval prior to initiation of the change(s), except where necessary to eliminate apparent immediate hazards to the subject(s). Changes made to eliminate apparent immediate hazards to subjects must be reported to the IRB within 24 hours.
2. You must report all adverse and/or unanticipated event(s) that occur during the course of this study to IRB in writing in accordance with IRB Policy.
3. Use only IRB-approved copies of your consent form(s), questionnaire(s), letter(s), advertisement(s), etc. in your study. Do not use expired consent forms.
4. You must inform all research staff listed on this study of changes or adverse events which occur.
5. IRB's approval is valid until the end date of the performance period indicated above. A reminder for renewal should be e-mailed to you from the IRB 90, 60 and 30 days before this study's approval is scheduled to expire. However, you are responsible for submitting all renewal materials at least eight weeks before expiration regardless of whether or not you receive a reminder notice.
6. All IRB policy documents can be found on our website: <http://www.irb.nyu.edu>
7. Prior to initiating an IRB-approved study, you must receive written approval from an authorized representative for each site where your study will take place. Key contacts are:
 - o Bellevue Hospital (Bellevue Hospital Center Research Coordinators) Mr. Anand Veereraj, 212-562-4176; Mr. Santos Rivera, 212-562-7075; Mr. Juan Monserrate, 212-562-4904
 - o CTSI - Clinical and Translational Science Institute, NYU School of Medicine [formerly General Clinical Research Center (GCRC)], Hal Rosenblatt, Research Grants Coordinator, 212-263-7900; 212-263-8040.
 - o NYU Hospital Center (Tisch Hospital/Rusk Institute/Co-op Care/HJD/Cancer Center) approvals are handled for you automatically by the Office of Clinical Trials

Please Note: Prior to commencement of any research related activities at BHC as a site you MUST receive BHC and HHC approval. For any questions related to research at BHC contact their research office at 212-562-4176 (see above).

The IRB may terminate studies that are not in compliance with NYU Medical Center/School of Medicine Policies & Procedures and the requirements of the Institution's Federal Wide Assurance with the Federal Government. Direct IRB questions, correspondence and forms (e.g., continuing reviews, amendments, adverse events, etc.) to phone 212-263-4110, fax 212-263-4147 or email IRB-info@nyumc.org.

New York University School of Medicine's Institutional Review Board
550 First Avenue | #VET 10th Floor, West Wing | New York, NY 10016
phone 212-263-4110 | fax 212-263-4147 | email IRB-info@nyumc.org | web <http://irb.med.nyu.edu>
The NYU SoM IRB operates in accordance with Good Clinical Practices (GCP) and applicable laws and regulations.
The NYUSoM Federal Wide Assurance (FWA) number is 00004952. Board A Registration #: 00001015. Board B Registration #: 00001162. Board C Registration #: 00006676.

Appendix J

**Human Research Protections Program**

Herbert H. Lehman College (CUNY) HRPP Office

DATE: February 28, 2012
TO: Andrea Barnes-Grant
FROM: Herbert H. Lehman College (CUNY) HRPP Office

PROJECT TITLE: [301666-1] Hypertension Knowledge, Expectations of Care, Social Support, and Adherence to Prescribed Medications of African Americans with Hypertension Framed by the Roy Adaptation Model

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: February 28, 2012
EXPIRATION DATE: February 27, 2015
REVIEW CATEGORY: Exemption category #4

Thank you for your submission for this project. It has been determined that this project, as submitted, is EXEMPT according to federal regulations, under 45 CFR 46.101(b). As per CUNY policy, approval of exempt research is nonrenewable. The duration of study for exempt research is not to exceed three years. Investigators wishing to continue exempt research beyond the period specified on the approved application must submit a new application to the IRB for approval at the conclusion of the original period.

We will retain a copy of this correspondence within our records. If the scope of this project changes, you must submit a modification request form for a determination to be made whether the project remains exempt.

If you have any questions, please contact Alavy Sos at 7189608717 or hrpp.administrator@lehman.cuny.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within the City University of New York's records.

Appendix K

NYU School of Medicine

Clinical Directors Network

COUNSELING AFRICAN AMERICANS TO CONTROL HYPERTENSION (CAATCH) STUDY

Demographics

Study ID: _____

Date: ____/____/____

This form is intended to collect information about your background and lifestyle, which may impact your risk of cardiovascular disease. Please complete all items except those, which you are specifically instructed to skip. If you are unsure about the answer to a specific question, please estimate the answer to the best of your ability. If you have a question about a particular item, please write a small “X” in the margin of the form, and then ask a staff member for clarification of those items after you have completed the rest of the form.

1. What is your gender? Male Female

2. What is your ethnicity?

____ African American

____ Belizean

____ Chinese

____ Cuban

____ Dominican

- Haitian
 Jamaican
 Japanese
 Mexican-American
 Middle Eastern
 Puerto Rican
 Trinidadian
 Vietnamese
 Other Central or S. American
 Other West Indian / Non-Latino Caribbean
 Other (Specify): _____
 Unknown

3. **Are you of Hispanic Origin?** Yes No Unknown

4. **Where were you born?**

- One of the 50 US states (please specify state): _____
 Puerto Rico
 Another country (please specify country): _____

If born in Puerto Rico or another country, how many years have you lived in the US? _____

5. **What language is generally spoken in your home?** (Check all that apply)

- English Spanish Other _____

6. **What is your religious affiliation?**

- Christianity Islam Traditional Chinese
 Sikhism Buddhism Atheist/Agnostic
 Hinduism Judaism None
 Other: _____

7. **Do you practice your religion regularly?**

- No Yes N/A

8. How often do you visit your place of worship in one month?

_____ Visit **or** Religious holidays only

9. What is your marital status?

- Married/living with partner Separated
 Widowed Never married
 Divorced

10. What is the highest degree or level of school you have completed?

- No schooling Technical school certificate
 Grades 1-8 Associate degree
 Grades 9-11 Bachelor's degree
 Completed high school or GED Graduate or professional school
 Some college, but no degree

11. Employed? Yes No → *Skip to #13*

12. **Full-Time** **Part-Time** No

13. Unemployed:

- Retired Homemaker

14. What kind of work do/did you do or what was your job title? (e.g., registered nurse, personnel manager, auto mechanic, accountant, grinder operator, etc.)

The following questions have to do with family finances. We know from other research that financial strain is common and very important to consider in understanding people's health. The following questions will be used to help give us a picture of the various financial situations

experienced by persons participating in this study. Any information you provide is strictly confidential and will be used for research purposes only.

15. To help pay for your medical care, do you now have: (check all that apply)

Private insurance such as Blue Cross, Aetna, 1199 Fund, etc.

Medicare

Medicaid

HMO _____

Military or Veteran's Administration sponsored

None

Other _____

16. Have you experienced any of the following in the past year?

Marital separation/divorce..... Yes No Major personal
injury/illness..... Yes No

Loss of job/retirement..... Yes No Death/major illness of a close family
member..... Yes No

Loss/failure of business..... Yes No Death of a
spouse..... Yes No

Violence..... Yes No Major intra-family
conflict..... Yes No

Other major stress..... Yes No

(If yes, please specify) _____

17. Below is a list of income groups. Please tell me which group best represents your total combined family income for the past 12 months. This includes the total income before taxes earned in the past year by all family members living with you. Please include money from jobs, net income from business, farm or rent, pensions, dividends, welfare, social security payments and any other money received by you or any other family member living with you.

- Less than \$10,000
- \$10,000 - \$19,999
- \$20,000 - \$39,999
- \$40,000 - \$59,999
- \$60,000 - \$100,000
- Greater than \$100,000

The following questions are about your use of tobacco and alcohol. They will help us to understand the role of smoking and alcohol use in the risk of cardiovascular disease.

- 18.** Have you smoked at least 100 cigarettes in your entire life?

NOTE: 5 packs = 100 cigarettes

- | | | |
|---|-----------------------|----------------------|
| 1 | Yes | |
| 2 | No | [Go to next section] |
| 7 | Don't know / Not sure | [Go to next section] |
| 9 | Refused | [Go to next section] |

- 19.** Do you now smoke cigarettes every day, some days, or not at all?

- | | | |
|---|-----------------------|----------------------|
| 1 | Every day | |
| 2 | Some days | |
| 3 | Not at all | [Go to next section] |
| 7 | Don't know / Not sure | [Go to next section] |
| 9 | Refused | [Go to next section] |

- 20.** During the past 12 months, have you stopped smoking for one day or longer because you were trying to quit smoking?

- | | |
|---|-----------------------|
| 1 | Yes |
| 2 | No |
| 7 | Don't know / Not sure |
| 9 | Refused |

- 21.** On average, how many cigarettes do you smoke each day?

NOTE: 1 pack = 20 cigarettes

— — —

- 22.** During the past 30 days, have you had at least one drink of any alcoholic beverage such as beer, wine, a malt beverage or liquor?

- | | | |
|---|-----------------------|----------------------|
| 1 | Yes | |
| 2 | No | [Go to next section] |
| 7 | Don't know / Not sure | [Go to next section] |
| 9 | Refused | [Go to next section] |

23. During the past 30 days, how many days per week or month did you have at least one drink of any alcoholic beverage?

	—	Days per week	
	—		
	—	Days in past 30 days	
	—		
888		No drinks in past 30 days	[Go to next section]
777		Don't know / Not sure	
999		Refused	

24. One drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. During the past 30 days, on the days when you drank, about how many drinks did you drink on the average?

	—	Number of drinks
	—	
77		Don't know / Not sure
99		Refused

25. Considering all types of alcoholic beverages, how many times during the past 30 days did you have 5 or more drinks on an occasion?

	—	Number of times
	—	
88		None
77		Don't know / Not sure
99		Refused

26. During the past 30 days, what is the largest number of drinks you had on any occasion?

	—	Number of
	—	drinks
77		Don't know /
		Not sure
99		Refused

References

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