FACTORS ASSOCIATED WITH SELF-MANAGEMENT IN AFRICAN AMERICANS WITH HYPERTENSION

by

Linda P. Bolin

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Director of Dissertation: Patricia B. Crane, PhD, RN

Major Department: Nursing

African Americans (AAs) have a higher prevalence of hypertension (HTN) and poorer health outcomes. Effective management of HTN requires pharmacology, low sodium diet (DIET), and increased physical activity (PA). Little is known about self-management of DIET and PA in AAs with HTN. The aim of this study was to examine the influence of factors (systolic blood pressure, co-morbidities, serum potassium and creatinine, education, depression, locus of control (LOC), and social support) on self-management behaviors (DIET, PA).

Using a cross-sectional design, AAs with HTN who participated in a recent clinical trial completed instruments to measure the factors. Two multiple linear regression models were used: one including only internal LOC and one with only external LOC. The sample ($N = 77$) ranged in ages from 55 to 84 ($M = 66$; $SD = 7.68$), most were female ($n=50$; 65%), and had high medication adherence scores ($M = 93.8$; $SD = 9.77$). The models explained 28% of the variance in PA with depression, serum creatinine, and social support significantly contributing to the internal LOC model ($F = 3.361$ [8, 68]; $p = .003$. and also to the external LOC model ($F = 3.378$ [8, 68]; $p = .003$) The same models explained 23% of the variance in adherence to a low sodium diet ($F = 2.599$ [8, 68]; $p = .015$) with serum potassium and social support significantly contributing to both models.   Findings from this study inform the development of targeted interventions to increase self-management behaviors in AAs with HTN.

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A Dissertation

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In Partial Fulfillment of the Requirements for the Degree

Doctor of Philosophy in Nursing

by

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Linda Prior Bolin

APPROVED BY:

DIRECTOR OF
DISSERTATION: _____
                                     Patricia B. Crane, PhD, RN, FAHA, FNAP

COMMITTEE MEMBER: _____
                                     Carolyn E. Horne, PhD, RN, BC

COMMITTEE MEMBER: _____
                                     James R. Powell, MD, FACP

COMMITTEE MEMBER: _____
                                     Elaine S. Scott, PhD, RN, NE-BC

CHAIR OF THE DEPARTMENT
OF GRADUATE NURSING SCIENCE: _____
                                     Elaine S. Scott, PhD, RN, NE-BC

DEAN OF THE
GRADUATE SCHOOL: _____
                                     Paul J. Gemperline, PhD

DEDICATION

This dissertation is dedicated to my family.

You have been my circle of strength, inspiration, and love.

My husband, Paul, is beyond exceptional.

And our children, Jessica and Wesley, are truly gifts of God.

Together, forever, my heart belongs to the three of you.

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My deepest gratitude is extended to my family. To my parents, George and Ayako Prior, who always accentuated the importance of both education and a balanced life, and to my brother, Stephen Prior, who has experienced the PhD journey himself, and has strengthened me all along with his gift of fortitude and grit. To my ever-patient husband and children, none of this would have been possible without your love; my heart extends out to each of you. Thank you my sweet family, for all the sacrifices you have made to help me pursue my dream

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CHAPTER 1: INTRODUCTION

Background

Hypertension (HTN) is an epidemic, affecting one third of adults or one billion people worldwide. If unchanged over the next 10 years, the costs will be 1 trillion dollars globally in direct healthcare expenses (Chobanian et al., 2003; Gaziano, Bitton, Anand, & Weinstein, 2009). As of 2010, it is estimated that 78 million or 33% of the adult US population have HTN (Nwankwo, Yoon, Burt, & Gu, 2013). If left untreated, HTN can lead to heart disease and stroke, which are the leading causes of death in the US (CDC, 2013). Moreover, if the results from the recent Systolic Intervention Blood Pressure Trial (SPRINT) are confirmed, the definition of HTN could move from 140/90 mmHg to 120/80 mmHg which would lead to a two-fold increase in the number of people with HTN in the US.

In the US, HTN disproportionately affects African Americans (AA) at a rate of 42.1%, compared to non-AAs at 28% (Nwankwo et al., 2013). The prevalence rate of HTN in North Carolina reflects the national average. However the rural eastern regions of the state have a significantly higher prevalence rate, with 44% of AA women and 36.7% of AA men having HTN compared to 30.4% of Caucasian women and 28.1% of Caucasian men (North Carolina Department of Health and Human Services, 2013). In the US, the majority of the AA population receives health care for HTN management, however; only 58% have blood pressure control at their target levels compared to Caucasians at 65% (Ostchega, Yoon, Hughes, & Louis, 2008). A number of physiological traits, environmental characteristics, and behavioral factors contribute to this disparity, all of which result in outcomes of early morbidity and mortality. These morbidities include heart disease, heart failure, stroke, and end-stage renal disease. In the AA population, HTN is not only more severe, resulting in more comorbidities and complications, but

it also occurs earlier in life during young adulthood (Aronow et al., 2011; CDC 2013; Ferdinand, 2010; Mozaffarian et al., 2016). This is a crucial time period to develop and enhance self-management strategies.

Chronic diseases such as HTN have an economic impact, as well as debilitating effects over a lifetime. Annually, approximately $130 billion is spent towards HTN management with another $25 billion accounted for in lost productivity (CDC, 2010). While early detection is essential in achieving positive outcomes, given the prevalence of this disease, comprehensive management is also needed to control the disease to prevent insidious end-organ complications. Management should encompass a team approach within the health care system, involving not only providers, but also the active involvement of individuals and support systems to achieve enhanced self-management regimens and strategies. Once HTN is diagnosed, necessary knowledge, skills, and confidence are needed to follow treatment regimens, cope with psychosocial aspects of HTN, and carry out self-care activities. These are necessary self-management skills for individuals with HTN to maintain function in the context of their own lives.

Bourbeau (2008) describes self-management as acts or behaviors performed by individuals to minimize the impact of an illness on their own health status. The efficacy of self-management programs within the realm of chronic disease management is supported in the literature (Bodenheimer, 2003; Foster, Taylor, Elderide, Ramsay, & Griffiths, 2007, Janevic, Ellis, Sanders, Nelson, & Clark, 2014). According to Osborne and colleagues (2007), core concepts of self-management involve engagement in self-care, improved self-monitoring, interactions with health care professionals, and coping with disease. Self-management is a decision-making process that is characterized by the basic tenant of not only being able to manage one's self, but also in recognizing the individuality that encompasses the broad

provisions of each individual and the influential factors and their surrounding circumstances. It is a term that includes both provider input and individual initiated behavior for illness treatment and disease management. More importantly, individuals who are actively involved in decisions about their own treatment have improved health outcomes (Bodenheimer, Lorig, Holman, & Grumbach, 2002; Bourbeau, 2008). Furthermore, Bodenheimer (2007) reports a 5-step evidence-based approach to care for those with chronic diseases. The initial three steps focus on the provider understanding, learning and implementing the research, with steps four and five emphasizing the importance of patient understanding and assisting patients to incorporate self-management into their daily lives.

Self-management encompasses different belief systems which impact how individuals manage their own health care. Multiple cognitive predictors, such as self-esteem, health value, and self-efficacy have been identified in various models associated with health-related behaviors. In 1954, the concept of locus of control was derived from social learning theory to explain how expectancies can influence the relationship between behavior and reinforcement (Rotter, 1954). Locus of control is defined as an individual's generalized expectancies regarding the causes that determine success or failure. The determinants of either internal or external locus of control were proposed as the impetus for behaviors and outcomes (Rotter, 1954). Individuals with internal locus of control believe that success or failure is due to their own efforts. Whereas individuals with external locus of control believe that events in life are controlled by luck, chance or the environment. Since Rotter's original work, the concept has been refined and specific measurement tools have evolved (Marsh & Richards, 1986, 1987; Spector, 1988. Wallston & Wallston, 1981).

Thorough understandings of self-care practices that influence those with HTN are pivotal to improving the ability and enhancing the willingness to change or maintain successful

behaviors. A 2020 goal of Healthy People is to increase the proportion of adults with HTN to "take action" in controling their own blood pressure. One hallmark of self-care is active participation. Because AAs develop HTN at an earlier age with greater severity, have less success with control, and have more complications related to lack of control, further exploration and examination of self-management is warranted (Nwankwo et al., 2013). Expanding knowledge about the influences and understanding of self-management will provide essential information for future interventions.

Significance

Due to the clinical manifestations or presentation of HTN, it is known as the "silent killer." Those with HTN are often unaware that they have HTN until their diastolic or systolic pressures are elevated and have been elevated over time. This constant strain on the body to auto-regulate over time, places strain on the arterial walls and requires increased workload on the cardiovascular system to provide blood flow to the essential organs. The effects are felt on the major organs, including the heart, kidney, and brain; resulting in premature morbidities. These effects result in challenges for those individuals with HTN, their families, and the healthcare system managing their HTN.

Muntner and colleagues (2012) reported a substantially increased risk for the development of end-stage renal disease in the AA population.   This, along with the rates of coronary artery disease and stroke, is devastating for AAs. The southeast US from Baltimore, Maryland to New Orleans, Louisiana is known as the stroke belt with an inordinate prevalence of HTN (Howard, Prineas, Moy, Cushman, & Temple, 2006). Population statistics also show that there is a higher concentration of AA in this region as well (Howard et al., 2006). Researchers from the Reasons for Geographic and Racial Differences in Stroke (REGARDS) who sampled AA and Caucasians from the southeastern stroke belt reported that half of the racial disparity in

stroke risk is attributable to traditional risk factors, and of the half, HTN accounted for about half and diabetes approximately one fourth (Howard et al., 2006). Population statistics clearly demonstrate AAs have a higher rate of diabetes, and a higher prevalence of HTN.

There are many etiological components of HTN in the AA population. These include biological, environmental, and behavioral factors. Kaplan and Victor (2014) have identified 18 genotypes and intermediate phenotypes accounting for the familial and genetic predisposition in the AA population with HTN. Cooper and colleagues (2005) conducted an international comparison study of European versus African descendants. The results showed a higher prevalence of HTN in AA in the US compared to those native Africans. While there are biological differences in the mechanism of blood pressure control in this specific ethnic population, these data strengthen the need to further consider environmental and behavioral factors within the US. Socio-demographic characteristics, along with behavioral and psychological characteristics must be taken into account when exploring cohorts of the AA population in the US.

The National Health and Nutrition Examination Survey (NHANES) is a national survey that assesses the health and nutritional status of different population cohorts and health topics. Since 1960, the NHANES program has conducted both interviews and physical examinations to collect data to provide health statistics for the US. An analysis of data by Redmond and colleagues (2011) using the NHANES 2001-2006 found the rate of blood pressure control was worse among non-Hispanic blacks (27.4% with uncontrolled blood pressure) compared with non-Hispanic Whites (17.0% with uncontrolled blood pressure) and Mexican Americans (20.2% with uncontrolled blood pressure). The researchers also identified nutritional aspects and adherence to dietary strategies to lower prevalence of HTN as important components of blood pressure control. Factors not investigated in the NHANES are psychosocial factors related to

racial/ethnic disparities in the prevalence of HTN. Clearer understanding of these concepts in AA may provide valuable information about the self-management aspects of HTN and as such, improve the ability to change or maintain successful behaviors.

Core concepts of self-management involve engagement in self-care, improved self-monitoring, interactions with health care professionals and coping with disease. According to the American Heart Association (2015), there are simple self-management lifestyle strategies, including a 7-step plan that people can undertake to empower themselves. This plan is composed of healthy behaviors to assist in maintaining or attaining good health. Yet, AA men and women are not participating in these behaviors (Cooper et al., 2003a). More understanding is needed to determine what factors encompass self-management. Socio-demographics, physiological, and psychological characteristics, such as health locus of control need to be explored in AA population with HTN.

Purpose of the Study

The purposes of this study are to: (a) describe AA men and women with the diagnosis of HTN who demonstrate self-management behaviors and those who do not demonstrate self-management behaviors; and (b) examine the relationship between condition specific factors, individual factors, self-regulation, social facilitation, and self-management in AA men and women with HTN.

Conceptual Framework

The individual and family self-management theory (IFSMT) is a mid-range descriptive theory. Ryan and Sawin (2009) refer to IFSMT as an alternative perspective where components of the theory can be reviewed throughout the situation of interest. Rather than solely focusing on self-management interventions, programs, or patient education, the IFSMT emphasize specific

concepts that facilitate the development of self-management skills. This descriptive approach of a theoretical framework allows the complex phenomena of interest to be viewed from a multidimensional prospective. Ryan (2009) proposes the enhancement of the individual's knowledge and beliefs results in an increase in health behavior. Through the dimension of context where health-specific factors are examined, and the dimension of process where knowledge, self-regulation factors, and social facilitation are explored, positive outcomes can be achieved. To gain further understanding of the complexity phenomenon of factors associated with self-management, this model and its focus on addressing condition specific knowledge and self-regulation components of AAs with HTN provided a structure for this study.

Major Dimensions

The IFSMT model of Ryan and Swain (2009) was used to guide this study (Figure 1). The major dimensions of the IFSMT model are: context dimensions (risks and protective factors), process dimensions (self-management), proximal outcomes, and distal outcomes.

The context factors include condition specific information, physical and social environment data, and individual and family influences. Together these factors are grouped as risk and protective factors, which include physiological and functional characteristics of the condition, any physical or social factors regarding access to care, and lastly, data or descriptors on the individual or family characteristics. These contextual factors in the first dimension provide an assessment baseline.

The process factors focus on self-management and include knowledge and belief, along with self-regulation skills and abilities, and social facilitation. These factors in the second dimension focus on beliefs, abilities, and social supports of an individual that influence and encourage engagement in preventative health behaviors.

Although diagrammatically the proximal and distal outcomes are categorized as separate, Ryan and Sawin (2009) states that outcomes in the IFSMT are both proximal and distal. The proximal outcome is described as the actual engagement of self-management behavior that is displayed by an individual. Whereas distal outcomes are the factors or process that is the result of successful proximal outcomes. For example, if HTN is well managed, a proximal outcome, then there will be no end-organ damage such as renal failure, a distal outcome.

Context Risk & Protective Factors	**Condition Specific** Complexity of condition Complexity of treat,emt Trajectory	**Physical & Social** **Environment** Access to care, Setting and provider transitions, Transportation Culture, Social Capital	**Individual & Family** Developmental stages Perspectives, Literacy, Information processing, Capabilities
Process of Self-management	**Knowledge & Beliefs** Self-efficacy Outcome expectancy Goal congruence	**Self-Regulation** **Skills & Abilities** Goal Setting, Self-monitoring and Reflective thinking, Decision making, Planning and Action, Self-evaluation, Emotional Control	**Social Facilitation:** Influence Support Collaboration
Outcomes Proximal	**Self-management Behaviors:** Condition Specific		**Cost of Health** **Care Services**
Outcomes Distal	**Health Status**	**Quality of Life or** **Well Being**	**Cost of Health**

Figure 1. The Individual and Family Self-Management Theory

The influencing factors within each dimension have been reviewed carefully in relation to the aims of this study. Within the first dimension of context, condition specific and individual factors were used. Condition specific is defined as the physiological, structural, or functional characteristics of a condition. It includes the treatment or prevention of the condition needed to manage the condition during times of stability or transitions when the condition worsens (Ryan & Sawin, 2009). Individual refers to the characteristics of the individual that enhance or diminish self-management. This may include cognitive status, perspectives, information

processing, developmental stages, and literacy. This dimension provided an individualized view on each AA participant with HTN in this study.

In the second dimension of process, self-regulation and social facilitation was be used. According to Ryan and Sawin (2009), the process dimension is defined as the dynamic interaction among condition-specific knowledge, acquisition of self-regulation skills, and social facilitation. Self-regulation is the process that people engage in to achieve a change in health behaviors. This process is influenced by an individual's reflective thinking, decision making, self-evaluation, and emotion control. Social facilitation is the support that occurs within relationships which enhances an individual's capacity to change. This support consists of emotional or informational support provided to an individual with the explicit goal of assisting or facilitating their engagement in health behaviors. This dimension captured the essence of this study by exploring factors associated with self-management in the AAs with HTN.

Lastly, in the dimension outcomes, Ryan and Sawin (2009) include proximal or short term outcomes that lead to the attainment of long term outcomes or distal outcomes. Proximal outcomes encompass self-management behaviors and cost of health care services, whereas distal outcomes encompass health status, quality of life and cost of health. Proximal outcomes of self-management behaviors was used for this study. This last concept of the linear IFSMT model correlates with the overall research focus of this study of gaining an understanding of a condition specific (HTN) relationship with self-management. By using this IFSMT conceptual model as a guiding framework, the proposed conceptual model and selected variables was used for this study (see figure 2).
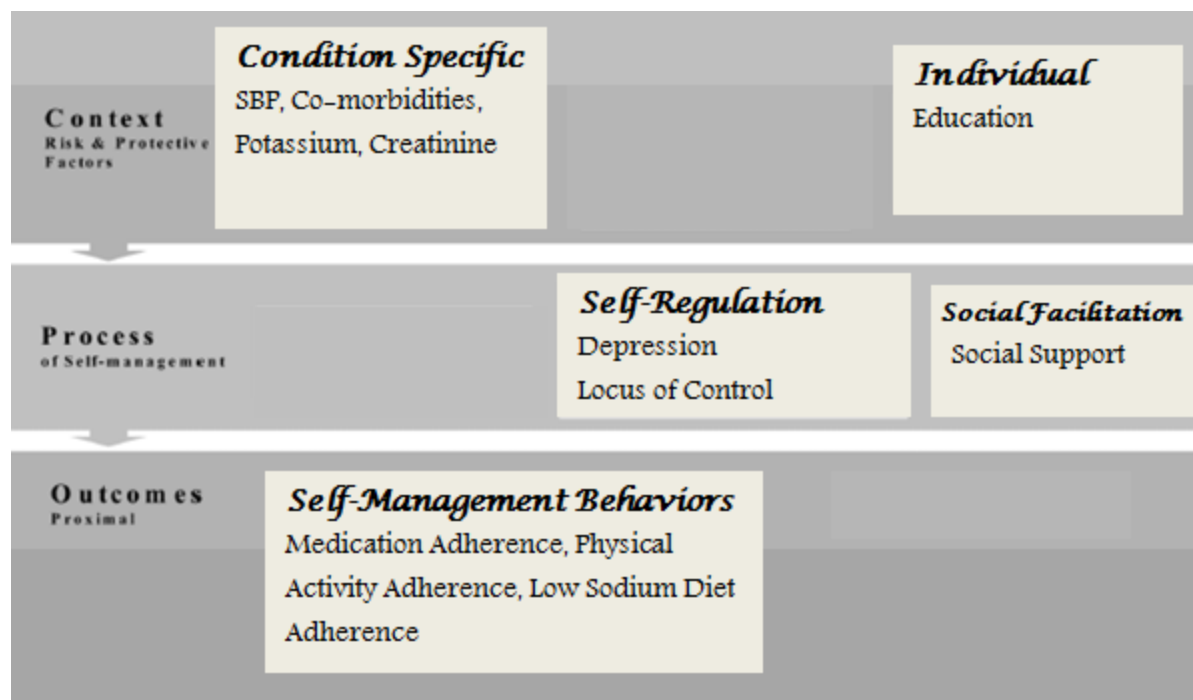
Figure 2. Proposed Conceptual Model

Basic Assumptions

There are assumptions that underlie this study. It is assumed that the physiological condition specific information is accurately measured by the instruments and recorded accurately onto the SPRINT data research forms. Additionally, it is assumed that the individual and social facilitation information was answered correctly by the participants and entered correctly onto the SPRINT data research forms. It is assumed that SPRINT participants have been told about adherence to medications and they have knowledge about the importance of adherence. It is also assumed that all participants are capable of self-management. Finally, it is assumed that the participants will truthfully answer all questions of this study.

Theoretical and Operational Definitions

A theoretical definition provides the basic meaning of a concept or variable of interest. An operational definition provides a metric or measurement to quantify a concept or variable of interest. Theoretical and operational definitions for each variable and concept of interest for this study are organized using the IFSMT.

Context

According to Ryan and Sawin (2009), context is defined as risk and protective factors which include condition specific factors that challenge or protect individuals' and families' engagement in self-management.

Condition specific.

Condition specific is defined as the physiological, structural, or functional characteristics of a condition. It includes the treatment or prevention of the condition needed to manage the condition during times of stability or transitions when the condition worsens (Ryan & Sawin, 2009). For this study, condition specific were operationalized to focus on the physiological data, and data obtained to assess the normal functioning condition of HTN. These data include systolic blood pressure (SBP), number of co-morbidities, and acceptable laboratory values to include potassium, and creatinine.

Systolic blood pressure.

Systolic blood pressure is defined as the highest arterial blood pressure of a cardiac cycle occurring immediately after systole of the left ventricle of the heart (Medical Dictionary - The Free Dictionary, n.d.). This pressure is determined by several interrelated factors, including the pumping action of the heart, the resistance to the flow of blood in the arterioles, the elasticity of the walls of the main arteries, the blood volume, the extracellular fluid volume, and the blood's viscosity, or thickness. Systolic blood pressure was operationalized for this study as the most

recent SBP reading of each participant's visit to the SPRINT clinic as recorded on the SPRINT intake research form. Per SPRINT protocol, this is the average of three SBP readings taken with the patient in a sitting position with feet flat and arm in a resting position.

Co-morbidities.

Co-morbidities are defined as a concomitant but unrelated pathologic or disease process; usually used in epidemiology to indicate the coexistence of two or more disease processes (Medical Dictionary- the Free Dictionary, n.d.). The co-morbidity listings of each participant was retrieved from the participant's SPRINT intake research form. These co-morbidities include: cardiovascular disease other than HTN and stroke (e.g. chronic heart failure, peripheral vascular disease), chronic respiratory disease (e.g. asthma, chronic obstructive pulmonary disease), Chronic Kidney Disease (eGFR 20-59 ml/min/1.73m^2), arthritis, and the diagnosis of diabetes after enrollment into SPRINT. Co-morbidities are operationalized as the sum total of the presence of comorbidities.

Laboratory values.

Laboratory values are tests of one or more substances from a subject. Labs are performed to detect or screen for or diagnose a disease, or to exclude its presence; to determine the severity of a disease; to monitor the progress of a disease, its response to therapy and prognosis; and to monitor drug toxicity (Medical Dictionary- The Free Dictionary, n.d.). The laboratory values are operationalized as the recorded results of each participant's most recent value (potassium and creatinine) as recorded on the SPRINT intake research form and categorized as normal or abnormal.

Individual.

Ryan and Sawin (2009) define individual as characteristics of the individual that enhance or diminish self-management. This may include cognitive status, perspectives, education,

information processing, developmental stages, and health literacy. In this study, the individual was operationalized to include education.

Education.

Education is defined as the knowledge, skill, and understanding obtained from attending a school, college or university (Merriam Webster, n.d.). For this study, the educational level was operationalized as the participants educational level as recorded on the SPRINT intake research form. These are categorized as: less than 12th grade, high school graduate/GED, some college, graduated from college, some graduate school, and completed graduate school.

Process

According to Ryan and Sawin (2009), the process dimension is defined as the dynamic interaction among condition-specific knowledge, acquisition of self-regulation skills, and social facilitation.

Self-regulation.

Self-regulation is a process that people engage in to achieve a change in health behaviors (Ryan & Sawin, 2009). This process is influenced by an individual's reflective thinking, decision making, self-evaluation, and emotion control. For this study, the self-regulation dimension was operationalized as the measurement of depression and locus of control for each participant.

Depression.

Depression is defined as a state of altered mood characterized by feelings of sadness, despair, and discouragement (Medical Dictionary - The Free Dictionary, n.d.). Depression was operationalized in this study as a score on the patient health question-9 depression (PHQ-9). The PHQ-9 instrument is a self-reported measure of depression that was administered to all SPRINT

study participants. It is a nine-item questionnaire with scores of each item ranging from "0" (not at all) to "3" (nearly every day). A total possible scores range from 0 to 27.

Locus of control.

Locus of control is defined as a theoretical construct designed to assess a person's perceived control over his or her own behavior (Dictionary.com 2016). For this study, locus of control is defined as a subscale score of the multidimensional health locus of control scale (MHLC) and based on this score, was categorized as internal or external locus of control.

Social facilitation.

Ryan and Sawin (2009) define social facilitation as the support that occurs within relationships which enhances an individual's capacity to change. This support consists of emotional or informational support provided to an individual with the explicit goal of assisting or facilitating their engagement in health behaviors. For this study, social facilitation was operationalized as social support.

Social support.

Social support is defined as a product of a relationship with an individual that either affects health or acts as a buffer to stressors that may impinge health (Bell, Thorpe, & LaVeist, 2010; Cohen & Wills, 1985). For this study, social support was operationalized as a score on the social support item associated with the outcome: medication adherence, physical activity adherence, low sodium diet, through the demographic health tool.

Outcomes

According to Ryan and Sawin (2009), outcomes include proximal or short term outcomes that lead to the attainment of long term outcomes or distal outcomes. Proximal outcomes encompass self-management behaviors and cost of health care services, whereas distal outcomes

encompass health status, quality of life and cost of health. For this study, outcomes was operationalized to include proximal outcomes of self-management behaviors.

Self-management behaviors.

Ryan and Sawin (2009) define self-management behaviors as the engagement in activities and treatment regimens, including symptom management and use of recommended pharmacological therapies. This study operationalized self-management behaviors as medication adherence, physical activity adherence, and low sodium diet adherence.

Medication adherence.

Medication adherence is described as the degree to which one correctly follows medical advice in taking prescribed medications as ordered (Medical Dictionary - The Free Dictionary, n.d.). Medication adherence for this study was collected from the demographic health tool. Participant responses were measured through the use of a psychometric visual analog scale (VAS) response scale. This adherence item response addressed medication adherence of the participant over the past month.

Physical activity adherence.

Physical activity is defined as the quality or process of exerting energy through bodily movements (Medical Dictionary - The Free Dictionary, n.d.). This includes bodily movements, such as those accompanying activities of daily living, and activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body. Physical activity adherence for this study was collected from the demographic health tool. Participant responses were measured through the use of a psychometric visual analog scale (VAS) response scale. This adherence item response addressed physical activity adherence of the participant over the past month.

Low sodium diet adherence.

A low sodium diet is defined as a diet that restricts the use of sodium chloride plus other compounds containing sodium, such as baking powder or soda, monosodium glutamate, sodium citrate, sodium propionate, and sodium sulfate, which contains approximately 500 mg (10 mmol) of sodium daily (Medical Dictionary- The Free Dictionary, n.d.). Low sodium diet adherence for this study was collected from the demographic health tool. Participant responses were measured through the use of a psychometric visual analog scale (VAS) response scale. This adherence item response addressed low sodium diet adherence of the participant over the past month.

Specific Aims and Research Questions

This study focuses on AAs with a diagnosis of HTN. The goal of this research study is to address the following specific aims and research questions:

1. Describe AA men and women with the diagnosis of HTN who demonstrate self-management behaviors and those who do not demonstrate these behaviors.

    Question (Q) 1. What proportion of AA men and women with HTN demonstrate self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence)?

2. Examine the relationship between condition specific factors, individual factors, self-regulation, social facilitation, and self-management in AA men and women with HTN.

    Q2. What is the association between condition specific factors (SBP, co-morbidities, potassium, creatinine), individual factor (education), self-regulation (depression, locus of control), social facilitation (social support), and self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence) in AA men and women with HTN?

Q3. Do condition specific factors (SBP, co-morbidities, potassium, creatinine), individual factor (education), self-regulation (depression, locus of control), and social facilitation (social support) influence self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence) in AA men and women with HTN?

Q4. When controlling for the individual factor (education), do condition specific factors (SBP, co-morbidities, potassium, creatinine), self-regulation (depression, locus of control), and social facilitation (social support) predict self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence) in AA men and women with HTN?

Summary

The purpose of this correlational non-experimental design study is to examine self-management behaviors of AA men and women with HTN. In addition, the relationship between condition specific factors, individual factor, self-regulation, and social facilitation with self-management was explored. The IFSMT provided a guiding framework for this study. Results of this study may assist clinicians and nurse scientists to develop a better understanding that could heighten awareness of factors associated with HTN self-management in the AA population. Public health programs and services could be developed through identifying health promotion strategies and interventions for this specific population to assist in the self-management of their HTN. These findings provided new knowledge, stimulate future research questions, and broaden the health knowledge for the nation.

This dissertation consists of chapters 1, 2, and 3 for the background, review of literature, and methods. The remaining chapters include two separate manuscripts. Chapter 4 is entitled,

"Factors Associated with Physical Activity Adherence in African Americans with Hypertension." The second manuscript is in Chapter 5 and is entitled, "Low salt Diet Adherence in African Americans with Hypertension."

CHAPTER 2: REVIEW OF LITERATURE

This review of the literature identifies the current state of knowledge for this study. According to the Agency for Healthcare Research and Quality (2009), the risk of Americans developing and dying from cardiovascular disease would be reduced if changes in behavior were made in diet and physical activity, and control of high blood pressure (BP). Elevated BP is one of the major contributors to the epidemic of cardiovascular disease in the United States.

High BP or hypertension (HTN) affects approximately 1 in 3 adults in the United States, and more than half of Americans with high BP do not have it under control (Ostchega et al., 2008). When examining the African American (AA) population, more than 40 percent have HTN (American Heart Association, 2014). It is a medical condition that develops earlier in life and is more severe in AAs possibly due to genetic traits, specifically salt sensitivity (Brandon et al., 2003; Peters & Flack, 2000; Richardson, Freedman, Ellison, & Rodriguez, 2013). The literature is abundant regarding the need for those with HTN to take control of their own BP but not as abundant regarding influencing factors for taking control towards achieving self-management.

This literature review focused on the theoretical perspectives of self-management and provided an overview of self-management behaviors specific to HTN. In addition, through the perspective of the individual and family self-management (IFSMT) model developed by Ryan and Swain (2009), selected dimensions, including the context dimension of the risk and protective factors, the process dimension of self-management, and the dimension of proximal outcome guided this literature review.

Theoretical Perspectives on Self-Management

Self-management is a term first used by Thomas Creer in the mid 1960's to describe how patients were active participants in their health care (Koch, Jenkin, & Kralik, 2004). The term is often associated with chronic disease management and closely linked with human behavior. Since its initial inception, there have been numerous theoretical perspectives on the concept which have evolved over time. The theory of planned behavior proposes that behavior is determined by self-efficacy and the person's attitude about the outcome (Fishbein & Ajzen, 1975). A similar theory evolved that included attitude and self-efficacy, but expanded to incorporate external influences and the concept of confidence, as needed to initiate an intervention for behavioral change (De Vries, Dijkstra, & Kujlman, 1988). The term self-efficacy refers to a person's belief in their own ability to carry out a certain behavior effectively (Bandura, 1986). This is a key component in Bandura's (1977) social learning theory and postulates that behavior is influenced by outcome expectations, social influences, and person's self-belief in their abilities.

Theoretical perspectives on self-management also emerged in the literature about patients, disease processes, and healthcare. Dorothea Orem, a nursing theorist, developed a self-care grand theory, which is broad in scope with general concepts that are applicable in all patient care settings (Afaf, 2012). The theory focuses on activities and performances of individuals in order to maintain life, health and well-being. Patient centered care along with efforts to promote patient activation and autonomy influenced the chronic care model and self-determination theory (Deci & Ryan, 1985; Glasgow, Toobert, Hampson, & Strycker, 2002). Petrie and Weinman (1997) reported on research using a self-regulation model since the 1970's that emphasize the importance of individuals understanding their illness or health condition. This self-regulation model has shown both negative and positive outcomes related to depression, quality of life, and

improved recovery following hospitalizations and management of disease processes (Detweiler-Bedella, Friedman, Leventhal, Miller, & Leventhal, 2008; Petrei & Broadbent, 2003; Petrie, Cameron, Ellis, Buick, & Weinman, 2002). The trans-theoretical model of change identifies stages that may be taken to change behavior: pre-contemplation, contemplation, action, maintenance and relapse, which has been used to individualize strategies to achieve positive behavioral health outcomes (Prochaska & DiClemente, 1983). Understanding the uniqueness of individual behavior and influences towards self-management is threaded throughout these varying, yet similar theoretical perspectives.

The literature reports strong evidence that understanding human behavior is essential with disease management and achieving positive health outcomes. However, models are still being developed that focus more comprehensively on the individual and the support they need to achieve their own self-management goals. Ryan and Sawin (2009) developed such a model, the individual and family self-management theory (IFSMT). The process of achieving positive outcomes must be fully understood from the individual's perspective to tailor strategies to meet their needs. The theory purports that this must be done in conjunction with assessing the context of their specific condition, which often ranges in complexity. Likewise, social facilitation is considered critical, whether through direct family or social support outside of immediate family in understanding the process of self-management. The dimensions of the IFSMT theory provide a framework for these factors that occur within the everyday life for the individual.

Dimension of Context

Two factors within the dimension of context for this study are condition specific and individual. A critical evaluation of existing research and findings was done related to the physiological characteristics of the condition, followed by the educational characteristics of the individual. The following examines the literature related to these two factors.

Condition Specific

Condition specific is the physiological, structural, or functional characteristics of a condition. According to Ryan and Sawin (2009), condition specific includes all the complexities of the condition that are needed during times of stability or transitions for treatment or prevention measures. For this study, condition specific consists of systolic blood pressure, co-morbidities, and acceptable laboratory values to include potassium and creatinine.

Dating back to the 1950's, studies such as the Veterans Administration Cooperative study (1967), focused on diastolic blood pressure as being the most important component in blood pressure. In addition, the first Joint National Committee on Prevention, Detection, Evaluation, and Treatment (JNC) of high Blood Pressure defined elevated diastolic BP as the target for therapy (National High Blood Pressure Education Program; Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 1977). Since then, Framingham investigators and other studies, including the Systolic HTN in the Elderly Program (SHEP) study, maintained the SBP below 160 mm Hg. The SHEP investigators in Europe and in China both maintained SBP below 150 mm Hg, and based their research design for treatment regimens focused on the SBP (SHEP Cooperative Research Group, 1991; Staessen et al., 1997; Liu, Wang, Gong, Liu, & Staessen, 1998). Results of these studies showed a reduction in cardiovascular events in elderly patients. The Action to Control Cardiovascular Risk in Diabetes (ACCORD) study maintained SBP at 120 mm Hg in patients with diabetes and HTN, but failed to demonstrate a benefit of lower blood pressure (The ACCORD study group, 2010). In contrast, SPRINT has shown a cardiovascular outcome benefit of lowering SBP to 120 mm Hg in non-diabetic patients with HTN (The SPRINT Research Group, 2015). Systolic BP, unlike DBP increases progressively with age, and aging populations (Strandberg & Pitkala, 2003). Thus, for this study, the systolic component of BP is more important to examine than diastolic component,

as the age range of participants are 55 and older. Co-morbidities in relation to factors associated with managing HTN are important to examine as well. In this study, co-morbidities included cardiovascular disease such as chronic heart failure, chronic respiratory diseases, such as asthma, chronic kidney disease, diabetes, and arthritis.

Bisognano and colleagues (2007) conducted a retrospective review of medical records and included patient characteristics, co-morbidities, treatment-related variables, and blood pressure goal attainment. The most common comorbidity was isolated systolic HTN. The diagnosis of diabetes and heart failure was associated with not achieving BP goals.

In another study, the HTN and arthritis study team of Maetezel and colleagues (2004) examined the economic burden associated with arthritis and HTN in a comparative study. Due to the prevalence of rheumatoid and osteoarthritis along with activity level limitations, it is estimated that an increase in the demands at both the individual level and health care level are related to this co-morbidity of arthritis. The findings confirmed that patients with rheumatoid arthritis faced a higher economic burden than those with osteoarthritis or HTN. This burden included diagnostics testing, medications, and visits to specialists. The researchers also reported the actual number of co-morbidities had a similarly strong association with disease costs for all diagnoses, emphasizing the importance of collecting data about the number of co-morbidities present.   The aim of this study focused on the economic burden, but further exploration of the personal burden on individuals in their management strategies of coping with HTN and multiple co-morbidities is lacking.

In a descriptive study focusing on poorly controlled AA's with HTN, Fernandez and colleges (2011) examined 1,039 participants from community health centers in the New York metropolitan area. The effectiveness of multi-level, multi-component, evidence-based interventions was studied. Demographic, clinical, psychosocial, and behaviors characteristics

were collected and analyzed. The results concluded that the majority of patients had one or more co-morbidities (79.7%) which attributed to overall poor physical health, and poor eating habits. The predominant co-morbidity was recorded as diabetes (35.8%). This study emphasizes the influences of co-morbidities on lifestyle, making co-morbidities an important factor to examine with adherence issues to physical activity and a low sodium diet. Although some of the descriptive demographics may be similar to other AA populations, a limitation of this study is its geographical location, an urban setting being different from the population in rural, eastern North Carolina with HTN.

Examining the prevalence of comorbidities in those with HTN is important. There is an economic burden and a compounded disease health burden also. Treatment regimens of different medicine classifications and therapies often overlap in treating co-morbidities. This in itself proposes challenges to providers and patients alike.   The presence of multiple co-morbidities and its complexities not only interface with HTN, but lead to a complexity of medical regimens that can affect self-management ability including medication adherence, physical activity adherence, and adherence to a low sodium diet.

Patients with HTN and other co-morbidities are typically on multiple medications, such as diuretics, beta-blockers, angio-converting enzyme inhibitors, calcium channel blockers, alpha blockers, and vasodilators. Due to the various clinical profiles and side effects of these medications, early changes in clinical parameters are important to monitor to prevent serious adverse effects. Monitoring of renal function and electrolytes at baseline and during treatment is essential. This is especially true for patients with multiple co-morbidities. For example, any loss of renal mass leads to a disturbance in the patient's auto regulatory mechanism of the renal vasculature. This requires small progressive changes or possible discontinuation of certain

medications.   Some medications may interfere in the renin-angiotensin system possibly resulting in an increase in serum potassium and creatinine (Kaplan & Victor, 2014).

There are limited studies examining the condition specific factors of laboratory values during times of stability or transitions for HTN treatment. In the Framingham Heart Study, a serum potassium level of $\geq$ 5.2 mEq/L or $\leq$ 4.0 mEq/L was identified as possibly increasing the risk of developing HTN, though not statistically significant (Lago et al., 2008; Walsh, Larson, Vasan, & Levy, 2002). The same study showed that serum sodium level was not related to HTN. Past studies including the NHANES and British regional heart study suggested that hyperkalemia increased cardiovascular mortality (Alderman, Cohen, & Madhavan, 2000; Wannamethee, Lever, Shaper, & Whincup, 1997). A more recent study done by Xi and colleagues (2015) examined the association between serum potassium and sodium and the incidence of HTN in a Chinese community-based population. Understanding that potassium and sodium are essential in the maintenance of cellular functions, the researchers found that elevated serum potassium could increase the risk of HTN and renal function may affect the level of serum potassium. The association between serum potassium and HTN risk was independent of renal function, and no association between serum sodium and risk of HTN was found.

Evidence from the literature review supports the relationship of HTN, co-morbidities, potassium and creatinine as factors to measure when examining adherence. However, limited studies have examined the population group of interest and the geographical area of interest for this study. More research is needed in the rural southeast area studying the AA population with existing HTN.

Individual

Ryan and Sawin (2009) define individual as characteristics of the individual that enhance or diminish self-management and may include cognitive status, perspectives, information

processing, developmental stages, and literacy. According to the theoretical underpinnings of the IFST model, individual factors are those characteristics of the individual directly. These preceding characteristics of cognitive status, information processing ability, and literacy level, are all related. For this study, to attain each participant's individual factor, the educational level was collected for each participant. A literature review related to the variable of education follows.

There are limited studies examining the variable of educational level in relation to cardiovascular disease. Dinwiddie and colleagues (2015) explored if income and educational levels influences elevated inflammatory levels in cardiovascular disease. Through the national data base of 2001-2008 National Health and Nutrition Examination Survey, after adjusting for age, sex, and specific medication usage, non-Hispanic Blacks and Mexican Americans had higher C-reactive protein levels compared to non-Hispanic Whites. C-reactive proteins are core biomarkers for the inflammatory process. When comparing the non-Hispanic Blacks and Mexican Americans higher C-reactive protein level groups, income lessened the magnitude of the association for both race and ethnic groups. The higher C-reactive protein levels for non-Hispanic Blacks and Mexican Americans were strongly associated with educational attainment. Based on the findings, these researchers suggest that educational attainment may be a powerful predictor in the inflammation pathway and emphasize the need to move beyond solely examining income as a predictor. This study focused on cardiovascular diseases as an entire entity. The condition of HTN in a specific population group of AAs is in need of further research regarding individuals' educational level when collecting and analyzing socio-demographic data.

Non and colleagues (2012) examined the dataset from the Family Blood Pressure Program (FBPP) study to explore the association between education and BP across racial groups. Two data sets were constructed from the publically available dataset of the FBPP. In comparing

Caucasians to AA participants, findings showed that education level was a significant predictor of BP. For each year of education, there was an associated drop in BP. One limitation of this secondary analysis study is that education was only one measure of social environment. Comprehensive measurers of dimensions that impact AAs with HTN should also include the role of social support. The association between education, locus of control, and social support needs further exploration and research. Educational level may decrease stressors, and increase locus of control, which may enhance social networks. This cascade has the potential to influence the challenges of the complexities of dealing with self-management behaviors of medication adherence, physical activity adherence, and adherence to a low sodium diet.

In another study, Pickett and colleagues (2014) examined educational levels of AAs and the relationship between HTN beliefs and self-care behaviors for BP control. Analysis revealed that beliefs about causes of HTN differed by gender and educational level. An educational level higher than 12 years showed that the participants were more likely to adhere to a low-salt and non-fat diet. This study demonstrates the importance of collecting data on educational level as a variable of interest when studying self-management behaviors.

Although educational level was not analyzed as a separate variable, a study on tailored interventions done by Dorrejo and Wilson (2012) also emphasized that successful management of HTN requires not only effective pharmacological management, but appropriate educational, and self-care approaches. Their research focused on interventions needed to target low-literacy groups to improve diet in the management of HTN. These studies emphasized the need for careful examination of educational level as a factor when studying self-management behavior.

The literature is abundant with research studies related to educational interventions, health literacy, and cognitive levels in AAs with HTN. Studies included individual perspectives, tailored educational interventions, and cognition related self-management in AAs (Greer &

Ostwald, 2015; Odedosu, Schoenthaler, Vieira, Agyemang, & Ogedegbe, 2012; Shaw, Armin, Torres, Orzech, & Vivian, 2012). A pilot study was conducted by Klymko's research team (2008) which explored the effect of cognition on HTN-related self-care and BP outcomes in AAs. Cognitive function, semantic fluency, memory and orientation were examined and compared to HTN self-management. The results indicated there was a strong positive association between memory and HTN-related self-care measurers.

Bosworth and colleagues (2006) examined clinical, demographic, and psychosocial factors relating to BP control. A total of 569 AA (41%) and Caucasian (59%) patients were enrolled in the study. Compared with Caucasians, AAs were more likely to have inadequate baseline blood pressure control. Among the 20 factors examined for a relationships to BP control, AAs had a higher odds ratio of being non-adherent to their medication, being more functionally illiterate, and having a family member with HTN compared with Caucasians.

Further exploration of cognitive and literacy levels is needed. Through assessment of educational levels, further investigations, such as this study may lead to an increased understanding of factors associated with self-management behaviors in AA's with HTN. The complexities of managing HTN for an individual require information processing ability. Effective self-management behaviors encompass a multitude of behaviors that must be incorporated into everyday life. Medication adherence, physical activity requirements, and healthy eating habits by following a low sodium diet are all constant challenges. Allowing those with HTN to gain understanding and knowledge may help the individual develop competency and confidence. Understanding the key factor of education attainment levels for this targeted population provided more data to researchers, and assist AA's with HTN in their daily and lifelong adherence challenges.

Dimension of Process

Two factors within the dimension of process for this study are self-regulation and social facilitation. A careful review of the research related to the influence of depression and locus of control related to the first factor of self-regulation was done. This was followed by a review of the literature related to social support under the second factor of social facilitation. The following examines the literature related to these two factors.

Self-Regulation

Ryan and Sawin (2009) describe self-regulation as a process that people engage in to achieve a change in health. It is influenced by an individual's reflective thinking, decision making, self-evaluation, and emotion control. For this study, the self-regulation dimension included the measurement of depression and locus of control for each participant.

Depression.

According to Hare and colleagues (2014), depression is often present in patients with cardiovascular disease. The degree of depression is related to the subsequent risk of mortality and other cardiovascular events. There are numerous studies in the literature about depression and various cardiovascular diseases. According to Frasure-Smith and Lesperance (2006), more than 60 prospective studies have studied the link of depression to hospitalized patients with coronary heart disease. Although fewer outpatient studies have been done, studies have shown a higher prevalence of depressive symptoms and depression in community dwelling adults with coronary heart disease as compared to those without (Rugulies, 2002; Thombs et al., 2006).

Specific to HTN, Almas and colleagues (2014) report those with HTN experience somatic symptoms, lower quality of life, and role impairment. In a community-based cardiovascular health study, Lenze and colleagues (2005) examined data of 5,888 participants. Elders who were persistently depressed for a minimum of four years lacked interest and energy

in engaging in physical activity and dietary measures that support BP control. The findings of

this study and others support the need of including a depression measurement tool when studying

self-management behaviors of physical activity and diet adherence (Cooper et. al., 2003b; Patten,

2001; Taylor, Washington, Artinian, & Lichtenberg, 2008).

In exploring medication adherence, Cene and colleagues (2013) examined the effects of

depressive symptoms, psychosocial stressors, and substance use in HTN medication non-

adherent AA men. Of the 196 AA men, the researchers found that greater depressive symptoms

were associated with more medication non-adherence ($\beta = 0.05$; standard error [SE], 0.01; $p <$

.001). None of the psychosocial stressor variables were associated with antihypertensive

medication non-adherence. Alcohol misuse was associated with increased medication non-

adherence ($\beta = 0.81$; SE, 0.26; $p < .01$), but it did not mediate the association between depressive

symptoms and medication non-adherence.

Lewis and colleagues (2012) completed a secondary analysis of a clinical trial

investigating the patient, provider, and health care system factors associated with medication

adherence in AA males with HTN. Over one half of the participants (54.9%) were non-adherent

to their HTN medication regimen. In a hierarchical regression analysis their findings consisted of

patient factors that predicated medication adherence. These factors were age, self-efficacy, and

depression. This study reinforces the need for a careful assessment of depression due to the

potential adverse burden of chronic diseases such as HTN.

In another study conducted by Schoenthaler and colleagues (2009), the relationship

between depressive symptoms, self-efficacy, and medication adherence was examined in AA

adults with HTN. Participants were part of a larger parent study in primary care clinics in a large

urban city. The researchers propose that past studies have documented the negative effects of

depression on adherence, but little is known about the underlying relationship. The findings indicate that depressive symptoms were significantly related to poor medication adherence.

Locus of control.

The literature is abundant about the association of depression and HTN (Cooper et. al., 2003; Patten, 2001; Taylor, Washington, Artinian, & Lichtenberg, 2008). However, the literature is limited about locus of control as a factor that is associated with the AA population with HTN. These following studies focused on belief systems, motivation, attitudes, and influences on the process of self-management.

In 2010, Peters and Templin conducted a qualitative study of 306 AA subjects to test a conceptual framework that integrated the theory of planned behavior, within the theory of Orem's (2001) self-care theory. Focus groups were held to elicit culturally specific attitudes and beliefs that influenced BP control. The results did not show a predictive intention, but rather an underlying factor related to goal belief, which is related to the concept of motivation. The addition of exploring locus of control could add another dimension to self-management behaviors related to BP control.

In another qualitative study by Kronish and colleagues (2012), AAs and Latinos in a primary clinic were interviewed to gain understanding about their beliefs with respect to having HTN. Findings included that having symptoms was correlated with having high BP, and if no symptoms were present, their medication was working. The belief was that HTN was transient in nature. Themes about the health care system centered on "trust and respect" and the feeling of "intimidation" by physicians. Stress was a common recurrent theme, with AAs attributing this to social inequities and racism, whereas Latinos described stress as a natural part of everyday living. The AA participants were more likely to distrust the health care system and prescription medication and Latinos were more likely to rely on traditional remedies in treating HTN.

A cohort of 185 low-income AAs with HTN from a larger parent study, were contacted through a computer-tailored interviewing system to explore the relationships between self-efficacy, barriers, and multiple behavior change over time (Mansyur, Pavlik, Hyman, Taylor, & Goodrick, 2013). Rather than studying locus of control, the researchers studied self-efficacy and behavior change measures. The multiple behaviors focused on were smoking cessation, low sodium diet, and physical activity and this cohort was tracked in real time while the participants were in the process of changing their behaviors. Various barriers were found to interfere with the ability to change behavior. Higher self-efficacy was associated with a reduction in smoking, whereas, the stresses of everyday life presented powerful barriers to smoking cessation. Higher self-efficacy was marginally associated with more physical activity, with acute medical condition or comorbidities, such as asthma or arthritis, identified as the most frequently reported barrier to physical activity. Higher self-efficacy about a behavior leads to a belief of being able to control the outcome of a situation.

As this study adds to the literature about the relationship of behavior change and self-efficacy, less is known about behavior change related to locus of control. The extent to which the dimension of self-regulation and locus of control is associated with self-management in AAs with HTN warrants exploration.

Ahmedani and colleagues (2013) studied the relationship God and other locus of control factors with the use of inhaled corticosteroid adherence among asthma patients. Their findings found medication adherence low in those patients who had a stronger belief that God, external control, determined asthma control. These results suggest further investigations are needed about locus of control and medication adherence related to other diseases processes. In a pilot study conducted by Rydkewsja and colleagues (2013), health-control beliefs and locus of control was examined in heart failure patients. The researchers emphasized the psychological

components as important to explore among patients with chronic diseases that require lifelong adherence to medical self-management regimens. Their findings showed patients with heart failure exhibited similar values of internal control as to those patients with diabetes, men post myocardial infarction, women post mastectomy, and to the healthy control subjects. In terms of external locus of control, this value was higher in the heart failure patients compared to others with the exception of the post-mastectomy patients. These results suggest that evaluating and understanding psychological features are beneficial in developing strategies to enhance patient adherence. This study sample focused on patients exhibiting clinical manifestations that heighten their awareness.

Often patients with HTN are asymptomatic for decades. This is a very different presentation when compared to other chronic diseases. Clearly, the management of HTN requires self-regulation (Chen, Tsai, & Lee, 2009; Patel & Taylor, 2002; Ross, Walker, & MacLeod, 2004).   However, based on gaps in the literature, factors that influence self-regulation, including depression and locus of control in AAs with HTN warrant further investigation.

Social Facilitation

Social facilitation is the support that occurs within relationships which enhance an individual's capacity to change (Ryan & Sawin, 2009). This support consists of emotional or informational support provided to an individual with the explicit goal of facilitating their engagement in health behaviors. For this study, social facilitation consisted of social support.

Social support.

Social support is an important determinant for an individual's physical health. According to Cutrona and colleagues (1986), there are six criteria used in research to measure the level of overall social support for an individual. These include: amount of attachment from a significant other, level of social integration, assurance of worth from others, reliable alliance support

provided from others, guidance of assurance from a higher figure, social enhancement from the opportunity of nurturing. A review of the literature related to social support, HTN, and self-management behaviors follows.

Klymko and colleagues (2011) conducted a study which utilized a subset from a larger randomized trial sample and studied the personal characteristics of 102 elderly AAs with cognitive difficulties to identify those patients needing support to enhance their self-management capabilities. Inclusion criteria included ages 60 to 89, making this one of the few studies focusing on this age group. With today's aging society, this is an important area of study. Forty-nine percent of the patients were found to have depressive symptoms which showed a strong association with poor social support, both which could affect self-management. This study focuses on older AAs and self-management issues, but also depicts how subsets from a larger cohort could reveal useful information through exploring correlational relationships of variables.

Lynch, Liebman, Ventrelle, Avery, Richardson (2014) conducted a randomized controlled trial, examining social support as one component, in 61 AA patients for a pilot study over a 6 month period in Chicago, Illinois. The study consisted of 18 group sessions led by a dietitian in a community with weekly telephone calls from a peer supporter. The intervention group received culturally tailored nutrition education focused on dietary changes and physical activity through behavioral skills training, and social support. Social support consisted of a motivational session and a prayer activity. The results indicated that the intervention arm was more effective than usual care of short-term education. A limitation of this study is that the intervention was focused more on diabetes and diabetic education, rather than HTN.

In a secondary analysis done by Bell and colleagues (2010), data from the NHANES were used to examine the association between HTN and race by levels of social support. Social support was operationalized as emotional support, financial support, and marital status.

Findings showed that the odds ratio of HTN increased in AAs without social support, suggesting a beneficial effect of social support on HTN.

Bosworth and colleagues (2006) examined 20 factors composed of clinical, demographic, and psychosocial data relating to BP control in 569 patients. Of the total sample, 41% were AAs and 59% were Caucasians. When comparing the two groups, AAs were more likely to have inadequate baseline blood pressure control. Among the 20 factors examined for relationships to BP control in this study, the results showed that AAs were more functionally illiterate and having a family member with HTN. These findings emphasize not all social support may be positive. Exploration of the type of social supports within family units and if the person identifies this as support for each type of adherence (medication, physical activity, low sodium diet) warrants further research. For example, a spouse may be a positive support to taking medication, but fail to encourage a low sodium diet.

Another study exploring social support was conducted by Warren-Findlow and colleagues (2012). A quantitative study of 188 AAs living in the southeast, focused on the intergenerational transmission of HTN knowledge and whether self-care of older parents would affect their adult children. Separate logistic regression models for older parents and adult children were used with medication adherence as the outcome. Family dyad-related characteristics were included, with results showing more medication adherence in the parent when compared to the older children. Given the finding of the wide age spectrum of AAs with HTN and the early onset of HTN in this population, exploring social support within the family unit may delineate factors which are positive influences on self-management.

An additional study examined 28 older AAs in a southeastern clinic (Rimando, 2013). The qualitative study was designed to explore perceived barriers to and facilitators of HTN management among underserved AA adults. Focused interviews were conducted followed by

thematic context analysis. Results reflected that participants' knowledge about HTN increased after attending the clinic on a regular basis. Barriers to HTN management were lack of money, lack of motivation to exercise, and fear of injury from exercising. Perceived facilitators included HTN management that resulted in weight loss, a new and unexpected diagnosis of HTN, family members with a diagnosis of HTN or diabetes, and social support. Living with HTN is difficult and social support was found to be a facilitator in HTN self-management in this study.

According to Uchino (2004), social support provides emotional support, tangible support, informational support, and companionship support, and is not always within the household unit living together. Emotional support provides value to the individual. Tangible support provides provisions of goods, materials, and financial support. Informational support provides information, education, and guidance to the individual. Lastly, companionship support provides a sense of belonging and sharing with another. Future research is needed to address the gap in the literature on gaining a better understanding of the determinants of social support, as social support can expand beyond the family unit and needs further exploration as a factor associated with self-management in the AA population with HTN.

Dimension of Proximal Outcomes

The factor of self-management behaviors was examined for the final dimension of proximal outcomes. According to Ryan and Sawin (2009), proximal outcomes are short term outcomes that can eventually lead to long term outcomes. For example, in populations with HTN, a short term outcome of blood pressure control through medication adherence can lead to long term outcomes of slowing the complications of HTN to other complex disease states, such as stroke and end stage renal disease; as well as resulting in health care expenditure savings. The following examines the literature on the multifactorial influences of self-management, which include medication adherence, activity adherence, and low-sodium diet adherence.

Bodenheimer et al. (2002) and Foster et al. (2007) emphasize the importance of self-management programs within the realm of chronic disease management. Once illnesses are diagnosed, necessary knowledge, skills, and confidence is needed for patients to follow treatment regimens, cope with psychosocial aspects of disease processes, and adhere to self-care activities.

Self-Management Behaviors

According to Ryan and Sawin (2009) self-management behavior is the active engagement in activities and treatment regimens and use of recommended pharmacological therapies. For this study, self-management behaviors consisted of medication adherence, physical activity adherence, and low sodium diet adherence.

Although beneficial, the limited study designs that focus on adherence provide only a portion of insight into self-management issues related to the hypertensive AA patient. Studies have acknowledged that there are multiple determinants, influences and boundaries that warrant exploration to generate information that not only explains knowledge and behavior at the time of BP measurement, but also identifies the influences and decisions that formulate knowledge and behavior. There is an effort in the literature to capture the influences on self-management through the development of tools which is showing progress towards a comprehensive assessment (Peters & Templin, 2008; Warren-Findlow & Seymour, 2011; Warren-Findlow, Seymour, & Brunner-Huber, 2012). Due to the multifaceted variables that influence self-management, these scales have been used in studies to assess knowledge and behavioral practices but still need validation. The following review of the literature focused on the three self-management behaviors of medication adherence, physical activity adherence, and low sodium diet adherence.

Medication adherence.

Warren-Findlow and colleagues (2012) conducted a quantitative study of 188 AAs in an urban southern city. It focused on the intergenerational transmission of HTN knowledge and self-efficacy and whether the self-care of older parents would affect their adult children. Separate logistic regression models for older parents and adult children were used with medication adherence as the outcome. Each model included demographics, health characteristics, partner's knowledge, and self-efficacy to manage HTN, along with the dyad-related characteristics. The results showed more adherences in the parent group with their medication when compared to the older children (p < 0.012). Studies have shown that AAs have early onset of HTN, therefore multiple generations are involved with managing high BP concurrently. Therefore by targeting the older adult to increase self-care knowledge empowers them to be the major influencer of HTN within a family unit.

There have been multiple studies focusing on the management of BP through medication adherence with the primary endpoint of BP readings kept at levels to prevent vascular damage (Bosworth et al., 2006; Crowley et al., 2013; McDonald, Pezzin, Peng, & Feldman, 2009; Migneault et al., 2012, & Ogedegbe et al., 2012). Following this pattern of strictly examining adherence issues, whether through monthly educational modules, telephone contact or automated computerized interventions and then measuring the effectiveness through the physiological impact does not encompass all the other possible variables associated with adherence such as self-management. In a qualitative study, participants expressed that having high BP correlated with having symptoms and if no symptoms were present, medications were working. However, they also stated that medications were not natural, were costly, and that HTN was transient in nature (Kronish et al., 2012). An additional concept in medication adherence that appears in the literature is that of trust. The issue of distrust, refusal of treatment and poor adherence to

treatment regimens in AA women was explored by Abel and Efird (2013). Findings showed that those who trusted their healthcare provider demonstrated adherence to medication regimens.

Other studies explore the concept of non-adherence to BP medications in relation to other potential mediating factors or associating symptoms such as depression (Cene et al., 2013; Hooper et al., 2016; Lewis, 2012; Lewis et al., 2012). These studies found that patient factors predicting medication adherence were self-efficacy and depression. Consistently, the AA population was found to have lower adherence to medication regimens and more depressive symptoms.

In a study focusing on patients with asthma and the use of corticosteroid inhalers, medication adherence was examined through a baseline survey using the multidimensional health locus of control scale to determine which sources had the stronger relationship (Ahmedani et al., 2013). The results showed that overall medication adherence was low at 36%, and patients with a stronger belief that God determined asthma control were less likely to be adherent. In comparing AA to Caucasian patients, the relationship was strong among AA patients. Blackmon and colleagues (2016) also conducted a study on patients' perceptions and beliefs in relationship to medication adherence. The study enrolled 45 AA patients with diabetes living in rural North Carolina. The majority of patients (63%) were found to have low adherence to their medication, primarily due to financial reasons. These participants frequently underused medication without notifying their provider and they perceived that they only had diabetes when their blood glucose levels were elevated. As an important determinant of disease outcomes, chronic conditions such as asthma, diabetes, and HTN need patients to be adherent in order to prevent deteriorating progression of the condition. These studies demonstrate the need to explore patient's beliefs regarding control when planning care. Limitations of the studies are the modes of medication administration, inhalation and injections, are different from that of patients with HTN, which is

primarily through the oral route. In addition, patients with HTN, typically take multiple

medications, which may also influence medication adherence and self-management.

The literature reported that race, trust, and patient-provider relationships are a recurrent

theme in the AA population when studying medication adherence (Brewer et al., 2013; Cuffee et

al., 2013; Forsyth, Schoenthaler, Ogedegbe, & Ravenell, 2014). Issues of racial discrimination

were associated with lower medication adherence in these studies. Grant and colleagues (2016)

found that greater expectations of HTN care along with greater social support resulted in greater

medication adherence. Basic patient education has always been in the forefront when discussing

self-management issues, however, relationships must be developed and assessed during patient

encounter visits. Relationships between patient and provider to evoke trust and open

communication, and a through intake history must be completed to assess patients' social support

structure. These small measurers could demonstrate greater outcomes.

It is well documented in the literature that medication non-adherence is a major factor

contributing to inadequate HTN control in the AA population (Barnes, Theeke, & Mallow, 2015;

Ogedegbe et al., 2012; Young et al., 2015). Research directed towards understanding the reasons

for this non-adherence is essential. Uncontrolled HTN in the AA population results in increased

rates for stroke, end-stage renal disease, and heart failure; all of which escalate the current cost of

health care (Boan et al., 2014; Cummings et al., 2016). If the trend continues, there will be an

added health and economic burden on our nation. The silent disease of HTN known as the

"silent killer" is being accompanied by the unrecognized risk factor of medication non-

adherence.

Physical activity adherence.

Evidence showing the benefits of physical activity in the prevention and treatment of

cardiovascular disease is well document (Thompson et al., 2003; Warburton, Nicol, & Bredin,

2006; Whelton, Chin, Xin, & He, 2002). An energy expenditure of about 1500 to 2200 kilocalorie per week is effective in decreasing the progression of coronary artery disease to reducing plaque in patients with heart disease (Franklin, Swain, & Shephard, 2003). Studies focusing on the biological mechanisms of physical activity and positive health outcomes show a reduction in BP, improvement body composition, reduction in C-reactive proteins, and beneficial changes in the endothelial function (Maiorana, O'Driscoll, Taylor, & Green, 2003; Nicklas, You, & Pahor, 2005). However, patients with HTN have difficulty with physical activity due to medications (beta blockers), co-morbidities associated with HTN (arthritis), and end-organ damage (CHF).

Past study findings have shown that overall physical activity significantly decreases BP (Halbert et al., 1997; Whelton et al., 2002). More recently, Cornelissen and Smart (2013) conducted a meta-analysis examining the more specific effects of aerobic exercising and resistance training on both SBP and diastolic BP for those participants with HTN. Those with aerobic exercise training had significant reductions of 4.3 mm Hg in SBP and 1.7 mm Hg in diastolic BP. In a different meta-analysis conducted by Huang and colleagues (2013), aerobic exercise training was also examined. A total of 23 studies of elderly adults were pooled together, with 4 of the studies having participants with HTN enrolled. Results were significant for a net decrease of 5.3 mmHg in SBP and 3.7 mmHg in diastolic BP.

Regular physical activity is commonly recommended as an important lifestyle modification in primary and secondary prevention of chronic cardiovascular diseases. The challenge lies in implementing programs to engage in regular physical activity. The literature has identified barriers specific to physical activity include time limitations, lack of energy, co-morbidities or health problems, schedule issues, and lack of social support (Ainsworth, Wilcox, Thompson, Richter, & Henderson, 2003; Griffith, Allen, Johnson-Lawrence, & Langford, 2014).

Warren-Findlow and Seymour (2011) designed a cross-sectional study of AA families living in a metropolitan area in the Southeast US. Self-care activities were measured through the use of the HTN Self-Care Activity Level Effects (H-SCALE). This 31-item tool was developed following an expert panel review and piloted on a convenience sample of 44 adults with HTN by the researchers. Internal consistency of each subscale was examined using Cronbach alpha with acceptable reliability. The researchers interviewed 186 AAs and administered the H-SCALE to gain data on self-care activities that contributed to BP control experiences by this specific population. As in their pilot study, all self-care domains had acceptable to good Cronbach alpha scores for medication usage (0.84), low-salt diet (0.74), weight management (0.87), and alcohol use (0.88), which reflects good face validity and reliability for the 6 self-care activity domains for HTN. The participants reported a minimum of 30 minutes of physical activity daily, and 75% of the sample was overweight or obese. These findings are congruent with other research findings. The literature reported that overweight AAs are less accurate in perceiving their weight status, and they underestimate their risk for chronic illnesses such as HTN (Bennett & Wolin, 2006; Moore, Harris & Wimberly, 2010).

In a pilot study done by Griffith and colleagues (2014), a program was developed to determine if it could increase physical activity in AA men. Weekly training sessions were held for groups of 5 men over a 10 week period. Personal training and community resources were made available. Improvements in outcomes were detected in perceived self-efficacy to sustain physical activity, endurance, overall health status, and stress level. Physiological and fitness outcome measures improved but were not to significant levels. This study reflects how success can be achieved in the process of self-management. The dimension of self-regulation and social support were precursors that led to the successful outcome of physical activity adherence. This finding is consistent with behavior-influences for physical activity in AA women (Jackson et al.,

2016; Joseph et al., 2013; Shuval et al., 2013). The tailored intervention of a fitness regimen designed specifically for men could further be explored. In contrast to this study, a secondary analysis was done by Harris and Chew (2014) on data collected from a cohort of 89 participants examining the benefits of Vitamin D supplementation on blood measure predictive of diabetes risk. Throughout the 12 week parent study, participants were weighed at every visit, and then counseled, educated, and given information about care seeking, and weight loss strategies at three different data collection visits. At the end of the parent study, 37% of the participants maintained their weight within 1 kg of their baseline weight, and only a few of the participants recalled receiving information about weight loss strategies. This study demonstrates that efforts must go beyond counseling at the clinic visit. Strategies and tools for prevention of inactivity and maintenance of physical activity must be tailored through a sustained effort to make a difference. Careful exploration of factors and variables are needed to gain a full understanding of the ethos of specific populations.

This theme of health perception with regards to the benefit of physical activity was also studied by Mathieu and colleagues (2012) in a longitudinal study of cardiovascular health. Physical activity participation and health perceptions were assessed among 3,018 participants of different ethnic groups over a two year period. Results were that AA and Hispanics were less likely to participate in physical activity compared to Caucasian. Of interest, greater than 94% of all participants felt that physical activity was effective in preventing a heart attack across all ethnicities, possibly indicating that there may be other ethnic-specific factors contributing to physical inactivity. Shuval and colleagues (2013) explored the physical inactivity or sedentary behaviors of ethnic minorities through a qualitative approach. Semi-structured interviews were used to evaluate perceptions of physical activity and sedentary behaviors in a sample of low income urban adults. As in previous studies, the participants acknowledged the positive health

benefits of physical activity. Thematic analysis revealed barriers to engage in physical activity as lack of time, insufficient finances, and neighborhood crime. Conversely themes to aid in physical activity were identified as possible weight loss, presence of social support, and available safe recreational parks. Participants in this study were unfamiliar with the term "sedentary behaviors" and did not perceive a relationship between sedentary behaviors and health outcomes.

Thomson and colleagues (2015) conducted a secondary analysis of a 6-month, community-engaged intervention targeting HTN risk factors in a southern AA cohort. Analyses of data from 269 participants revealed that education session attendance, and weekly steps/day pedometer diary submissions were strongly correlated with five health outcomes: body mass index, percentage of body fat, fat mass, low-density lipoprotein levels, and physical activity. These findings were similar to those of Mathieu and colleagues (2012) emphasizing that once knowledge is obtained about the importance of physical activity, reinforcement and follow-up is needed in order to see continued progress. To achieve outcomes of self-management behaviors, understanding of self-regulation and social facilitation enablers are needed. To address the need for participant engagement, Tussing-Humprheys and researchers (2013) conducted a quasi-experimental design in which eight churches were assigned to a church based diet and physical activity intervention group or to a control group. Retention rates of groups were at 85% and 84% respectively. The intervention consisted of an initial celebratory event for all participants. A group education session was held reviewing strategies for overcoming barriers to physical activity. A self-directed activity was adapted through the use of a regular daily walking activity tracked by pedometers and reviewed for all participants. Intervention participants received monthly newsletters featuring nutrition and physical activity topics, and testimonials from fellow church members about diet and physical activity changes they had made. The control participants received bimonthly newsletters about influenza, food safety, and how to minimize

stress. Physical activity was measured using the rapid assessment of physical activity survey. The survey also classified strength and flexibility physical activity into 1 of 4 categories — none, strength only, flexibility only, and both strength and flexibility. Significant changes in both self-reported aerobic ($p = .02$) and strength/flexibility ($p = .03$) physical activity outcomes were in the intervention group only. This study is suggestive that reinforcement of content, as well as social support of others attempting to achieve similar positive self-management behaviors has beneficial effects.

Living with HTN does not occur in isolation and is complex. The literature has identified barriers specific to physical activity including time limitations, lack of energy, co-morbidities or health problems, schedule issues, and lack of social support (Ainsworth et al., 2003; Griffith et al., 2014). When considering the array of factors and spectrum of possible relationships associated with self-management of multiple behaviors and adherence, the literature does not support one mechanism for influencing physical activity adherence. Therefore studies must consider multiple factors when examining factors affecting the self-management behavior of physical activity.

Low sodium diet adherence.

There are numerous studies in the literature that have demonstrated a relationship between salt intake and BP (Cook et al., 2007; Cutler, Follmann, & Allendeer, 1997; He & MacGregor, 2002; Sacks et al., 2001; Taylor et al., 2008). A decrease in salt intake can have a direct effect on decreasing blood pressure, which would ultimately result in major healthcare cost savings. According to Ha (2014), cardiovascular health benefits can be seen with a reduction in dietary salt of 9-12 g/day to the recommended level of less than 5-6 g/day. The landmark study, dietary approaches to stop HTN (DASH), is known as the trial that supports a low sodium diet lowering blood pressure (Sacks et al., 2001). It was a multi-center trial that studied three levels

of sodium intake (150, 100 and 50 mmol/day) on participants for 30 days. The sample consisted of 412 individual with and without HTN. When the participants were shifted from a high sodium diet to a normal sodium diet, the systolic BP decreased by 2.1 mmHg ($p < 0.001$) in the control group and by 1.3 mmHg ($p = .03$) in the DASH group. When participants were shifted from a normal sodium diet to a low sodium diet, there was a further reduction in systolic BP of 4.6mmHg in the control group ($p < .001$) and 1.7mmHg in the DASH group ($p < .01$). When compared with the controls, the DASH diet led to a lower systolic BP of 7.1 mmHg in participants without HTN and 11.5mmHg in participants with HTN.

Epstein and colleagues (2012) recognize the accepted non-pharmacological approach of the DASH diet, but emphasized that more research is needed about how patient characteristics affect dietary adherence. In a 16 week randomized, clinical trial of diet and exercise, 144 participants with a body mass index of 25-39.3 and HTN were enrolled. Participants were randomized to one of three groups: DASH diet alone, DASH diet plus weight management, and usual diet controls. Linear regression was used to examine potential predictors of post-treatment DASH diet. Analysis of covariance was used to examine the relationship of adherence to the DASH diet and BP readings. Results demonstrated a greater adherence to the DASH diet was associated with larger BP reduction independent of weight loss. Also, the AA participants were less likely to adhere to the DASH diet when compared to Caucasian, suggesting an area in need of further research.

Mansyur and colleagues (2013) explored the relationships between self-efficacy barriers and behaviors over time in 185 AAs. The behaviors were smoking reduction, increasing physical activity, and following a low-sodium diet. Findings demonstrated different barriers were associated with behavior change other than self-efficacy. For the low-sodium diet, "no will power" and "traditions" were the identified barriers and not associated with lower self-efficacy.

This is consistent with the findings of Lennie and colleagues (2008), who found that although 74% of the patients reported following a low sodium diet most of the time, only 40% were adherent based on their 24-hour urine sodium excretion. These study findings are suggestive that emphasis for behavioral changes in self-management cannot be based on self-efficacy alone for these 185 AAs.

In a study conducted by Warren-Findlow and Seymour (2011), AA families living in an urban city in the Southeast US were administered the H-SCALE to measure self-management activities. The domains of weight management and low-salt diet suggested the need for comprehensive educational program delivery related to these activities. The study's participants were predominately female with one-fourth of them having a 4-year college degree and one-third with an income greater than $50,000. A limitation of this study is the population is very specific and the results are applicable to that specific AA population alone. Although the findings suggest the need for comprehensive educational programs, this is not congruent with a qualitative study done by Smith and colleagues (2006). In their qualitative analysis exploring the cultural value of salt in the AA population living in the south, there was a strong cognitive barrier of understanding the importance of salt reduction. Salt reduction and sugar reduction were both perceived to have the same health effect. According to Smith and colleagues (2006), following a low sodium diet may be difficult for AAs in the South because of the strong regional emphasis on its flavor enhancing qualities and its usage in traditional foods. There are only a few studies that researched dietary tradition as barriers to HTN control in the AA population (Horowitz, Tuzzio, Rojas, Monteith, & Sisk, 2004; Peters, Aroian, & Flack, 2006). Adherence to a low-sodium diet is complex and multifactorial. The population of rural AAs, living in the South, warrants further exploration in terms of understanding the factors influencing self-management behaviors of diet when living with HTN.

Positive self-management behaviors not only improve a person's sense of well-being, but it also gives those with HTN a better understanding of their disease process and a sense of control. Adhering to the prescribed medication regimen, adhering to physical activity on a regular basis, and adhering to a low sodium diet all have positive influences on BP control which leads to positive proximal outcomes.

Summary

This literature review supports the need for more contextual understanding about health behaviors and pertinent variables related to self-management that lead to positive outcomes. Key components that are patient-centered need to be identified, which could then lead to the crucial process of enhanced self-management regimens and strategies. With high BP being one of the most preventable causes of cardiovascular disease morbidity and mortality in the AA population, the need to explore behavioral components and choices of patterns related to self-management is needed. Unless the patient truly embraces the information in a uniquely meaningful way to themselves, value or trust will not be placed into the strategies offered. Further research efforts to maximize a full understanding of the multifaceted aspects of self-management provide proximal outcomes for the population of eastern North Carolina.

Through exploring various factors associated with self-management behaviors in AA men and women with HTN, this research study added to the understanding and knowledge leading to improvements in providing appropriate and effective care to AAs and their families.

CHAPTER 3: METHODS

Introduction

Chapter three reviews the methodology to study the factors associated with self-management in the African American (AA) population with hypertension (HTN). This includes the study design, setting, sample and sampling process, protection of human subjects, instruments, data collection procedures, and data analysis procedures. A discussion of limitations is included along with a concluding summary.

Design

A cross-sectional descriptive correlation design was used to examine AAs with HTN and their self-management behaviors. This study used a subset of participants in a larger randomized controlled clinical trial: the Systolic Intervention Blood Pressure Trial (SPRINT). Data included condition specific (systolic blood pressure, co-morbidity score, potassium, creatinine), individual factor (education), self-regulation (depression, locus of control), and social facilitation (social support) that may influence self-management behaviors (medication adherence, physical activity adherence, and low sodium diet adherence).

According to Polit and Beck (2012), cross-sectional studies are designed to examine or collect data at one time point or over a short period. Data can be collected on individual characteristics to investigate associations and outcomes of interest. In this study, data were collected on each participant to gain understanding about the outcome of their self-management behaviors at a given point in time, therefore the cross-sectional design is appropriate. The first aim of this study is to describe AA men and women with the diagnosis of HTN who demonstrate self-management behaviors and those who do not demonstrate self-management behaviors. The second aim is to examine the relationship between factors (condition specific, individual, self-

regulation, social facilitation) and self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence) in AA men and women. A descriptive correlational design fits these aims because the relationship or association between variables is examined. The independent or dependent variables cannot be identified as causing the behavior, but rather a relationship between variables is described through a descriptive correlational research design (Fawcett & Garity, 2009; Polit & Beck, 2012).

Setting

The setting for this study is in an outpatient clinic at Brody School of Medicine, East Carolina University (ECU) in Greenville, North Carolina. This clinic serves as the clinical practice site for the SPRINT trial, which is a 2-arm, multicenter, randomized clinical trial designed to test whether a treatment program aimed at reducing systolic blood pressure to a lower goal than currently recommended will reduce cardiovascular disease. Participants were recruited from the current cohort of 256 SPRINT research participants. A letter of support regarding participant recruitment from the local Principal Investigator (PI) of SPRINT is attached (Appendix B).

Sample

The target population for this study is a convenience sample of AAs with HTN residing in the rural eastern regions of North Carolina who are participants in the SPRINT trial. These participants were recruited from the local community and surrounding counties at free blood pressure screenings, senior citizen centers, churches, private outpatient clinics, and federally subsidized outpatient clinics throughout the eastern region of North Carolina. Inclusion criteria for the parent study were: at least 50 years of age, systolic blood pressure greater than 130 mm Hg, along with one of the following risk factors of chronic kidney disease defined as eGFR 20-

59 ml/min/1.73m^2 or clinical cardiovascular disease other than a stroke or age 75 or older.

Exclusion criteria for the parent study were: indications for a specific antihypertensive

medication that will not allow the PI to adjust medication regimen according to the study

protocol, unable to stand for blood pressure (BP) readings, proteinuria, arm circumference too

large or small to allow accurate BP measurements with available devices, diabetes mellitus,

history of stroke, polycystic kidney disease, glomerulonephritis, symptomatic heart failure with

ejection fraction < 35%, clinical diagnosis of dementia, any medical condition likely to limit

survival to less than 3 years, pregnancy, living in same household as an already randomized

SPRINT participant, residence in a nursing home, and any factors judged by the clinic team to

likely limit adherence to interventions, such as alcohol or substance abuse within 1 year, lack of

support from primary care provider to adjust medications, or transportation issues. Participants

from both arms of the parent study were included. The total number of AA in the SPRINT trial at

ECU is 130.

A priori power analysis using nQuery Advisor was conducted to determine the study

sample size (Gatsonis & Sampson, 1989). The results of a power analysis for a multiple linear

regression, based on eight independent variables, testing that $R^2 = 0$ for the number of variables

with normally distributed covariates at 0.05 significance and 80% power as presented in Table 1.

Table 1
Power Analysis

Number of Variables	Squared Multiple Correlation, R^2	Power (%)	n
8	0.1000	80	144
8	0.2000	80	69
8	0.2500	80	54
8	0.3000	80	44

Using a moderate effect size of 0.20, a minimal sample of 69 (53% of target population) of African American (AA) participants were recruited from the parent SPRINT study to answer the research questions. The SPRINT study coordinator approached the clinic patients to provide a brief description of this study including the name and contact information of the PI. Eligibility requirements included diagnoses of HTN, enrollment in SPRINT trial for at least 1 year, English speaking, and cognitively intact. Exclusion criteria included the diagnosis of cancer or the development of any terminal illness since enrollment in the SPRINT study.

Human Subjects Protection

The approval for this study was obtained from ECU – University and Medical Center Institutional Review Board office (Appendix A). Federal privacy guidelines of confidentiality were followed. Access to the participant's medical records was not be needed as data collection for condition specific, individual factor, self-regulation and self-facilitation was from the SPRINT study or from the PI administered questionnaires.

The purpose of this study was explained to all eligible participants and all questions were addressed. Informed consent was written below the 8th grade level. As Paasche-Orlow and colleagues (2003) reported, almost half of American adults read at or below the 8th grade level. The PI read and reviewed the consent to each participant unless they elected to self-administer. The right to withdraw from the study at any time, as stated in the consent form, was explained to all participants. Withdrawal from the study did not result in any harm, negative consequences, or change in the care that was provided by the SPRINT clinic. All study participants received a copy of the consent form.

Potential risks to the participant included anxiety precipitated by answering questionnaires. If the participant or PI noted any anxiety or distress, the session ceased and the

participant was counseled and referred to appropriate resources as needed. The participant had

the option to withdraw from the study if they so desired without any negative repercussions.

Confidentiality was maintained on all data collection forms. Participants were assigned a

random identification number to maintain anonymity. The master log of participant's names and

identification number was secured separately from all data collection forms in a locked file

cabinet in a locked office. All consents and content related to the study were kept in separate

locked file cabinets in the PI's office in the College of Nursing at ECU and were only accessible

by the PI.

Instruments

Data were collected using investigator developed tools and standardized tools.

Investigator developed tools included the demographic health and physiological data tools.

Established, standardized tools included: (a) Multidimensional Health Locus of Control Scale,

and (b) Patient Health Question-9 Depression Instrument.

Demographic Health Tool

The demographic health tool was developed by the PI to collect descriptive information

about the characteristics of the participants (Appendix C). The demographic and health data

included age, gender, marital status, social support, education, medication adherence, physical

activity adherence, and low salt diet adherence. Age of the participant on their last birthday was

collected as an actual value. Gender is a nominal, self-identified measurement of female or

male. Marital status measurement is: single, married, divorced/separated, widowed, or co

habituating with a partner. Identification of who provides social support was self-reported as an

open-ended question. The degree to which this person provided social support was self-reported

on a Likert scale and measured as: none of the time, a little of the time, some of the time, a good

bit of the time, most of the time, and all of the time. A separate question for each dependent variable was used to denote specific social support for medication adherence, physical activity adherence and low sodium diet adherence.

Education was measured as: less than 12th grade, high school graduate/GED, some college, college graduate, some graduate school, completed graduate school. Knowing the distribution of demographics differentiates the characteristics of the sample and helps in determining how close the sample reflects the general population (Polit & Beck, 2012). The demographic health tool also included 13 items to assess the participant's knowledge and skill for managing their own health. A Likert scale was used and measured as: disagree, strongly disagree, agree, strongly agree, and not applicable (N/A).

Health data including medication adherence, physical activity adherence and low sodium diet adherence was collected. Medication adherence, physical activity adherence, and low sodium diet adherence was self-reported. These subjective responses were measured through the use of visual analog scales (VAS). Wewers and Lowe (1990) reported on the use of VAS since the 1920's in behavioral and social science research. Due to the simplicity and ease of use, it allows raters to subjectively interpret and respond on a continuous scale with a single mark that is placed through a straight scale line which is anchored on each end. The two anchors are labeled on the opposite ends of a single 100 mm horizontal line or continuum for reference points. For example, when questioning about the level of adhering to the healthy behavior of physical activity, one anchor is "none of the time" and the opposite end anchor is "all of the time." Wewers and Lowe (1990) report the VAS is a reliable and valid measurement tool. Interrater reliability of the VAS reports the correlation coefficient as .99. Subjective mood states have been evaluated using the test-retest method with correlations ranging from .95 to .99. The VAS length and positioning of the 100 mm line has been evaluated. There is no significant

difference between designs using vertical versus horizontal lines, although there have been some indications that participants prefer the horizontal design (Wewers & Lowe, 1990). For this study, horizontal VAS response scales were used.   The two end anchors measuring the extreme limits of the adherence parameters are "none of the time" and "all of the time**.** The VAS yielded a score for each adherence behavior. Additionally, the three VAS scores were summed to provide a total adherence score.

Physiological Data Collection Tool

The physiological data collection tool was developed by the PI to collect data about each participant's clinical profile (Appendix D). The tool included the most current: systolic blood pressure, co-morbidities, and most recent laboratory data of potassium and creatinine. Both systolic and diastolic blood pressure were collected, however, with the focus of the parent SPRINT study on lowering systolic blood pressure, this will be the independent variable used for data analyses. Co-morbidities will have a score of 1 to 5 for the presence of cardiovascular disease (other than stroke or hypertension), chronic respiratory disease, chronic kidney disease, arthritis, and the development of diabetes after enrollment into the parent study. The most recent height and weight were collected to calculate the body mass index (BMI), using the English formula: $BMI = weight (lb.) / [height (in)] 2 \times 703$. The most current recorded laboratory values of potassium and creatinine were collected. Measuring physiological data of interest allows the PI to compare variables and to quantify clinical profile associations of the sample.

Multidimensional Health Locus of Control Scale

The Multidimensional Health Locus of Control Scale (MHLC) is based on Rotter's (1954) social learning theory where locus of control is conceptualized as the likelihood of occurrences happening as a result of a particular behavior or beliefs. The MHLC can be applied

to many health-related situations and is sensitive enough to relate to a person's specific experience. Individuals who have high value and score high on the MHLC believe their own behaviors determine their health. Conversely, those that believe their health is determined by fate, luck, or chance are thought to be less likely to carry out recommended health behaviors, as they believe they have no control over their health. The MHLC has demonstrated high internal consistency and has held up remarkably well since its development (Wallston & Wallston, 1981). The evolution from a unidimensional scale to a multidimensional scale has resulted in an alpha reliability of .83 to .86.

The MHLC is in the public domain giving access for use by any researcher without explicit permission. It is composed of three forms A, B, and C. Forms A and B are equivalent forms that have a global focus on health locus of control. Form C is disease specific and has questions from Form A and Form B embedded into its scale. Because this research study is focused on patients with HTN, and the interest is in determining if participants have internal or external locus of control, the Multidimensional Health Locus of Control Scale - Form C (MHLC-C) was used (Appendix E).

The MHLC-C is a self-reported scale with 18 items. Response choices are on a 6-point Likert scale of 1-6 representing strongly disagree, moderately disagree, slightly disagree, slightly agree, moderately agree, and strongly agree. It has two 6-item subscales: Internal and External Chance, along with two 3-item subscales: Doctors and Other People. The score on each subscale is the sum of the values circled for each item on the subscale. All of the subscales are independent of one another. Wallston (2007) reports there are no items that need to be reversed before summing. There is not a total MHLC score, as dimensions are measured based on the subscales, as presented in Table 2.

Table 2

MHLC Scoring

Subscale	Possible Range	Item Number
Internal	6-36	1, 6, 8, 12, 13, 17
External	6-36	2, 4, 9, 11, 15, 16
Doctors	3-18	3, 5, 14
Other People	3-18	7, 10, 18

Responses for each subscale are added together for a score, where "1" is "strongly disagree" and "6" is "strongly agree." A score of 23-30 means there is an inclination to that particular dimension. A score of 15-22 means a moderate inclination on that particular dimension. A score of 6-14 means a low inclination on that particular dimension. Based on the study participant's scores on the internal and external subscales, each participant was identified as having internal or external locus of control.

Patient Health Question-9 Depression Instrument

The Patient Health Question-9 Depression (PHQ-9) instrument is a self-reported measure of depression that has been recommended by the American Heart Association Advisory Panel on Depression and Coronary Heart disease (Litchman et al., 2008). The PHQ-9 uses the frequency of symptoms for scoring purposes (Appendix F). It has a low response burden of 9 items and takes approximately 2-3 minutes to complete. Response choices are on a 4-point Likert scale of 0-3 representing not at all, several days, more than half the days, and nearly every day respectively. The minimal scores of 5, 10, 15, and 20 represent mild, moderate, moderately

severe, and severe depression respectively (Kroenke, Spitzer, & Williams, 2001). It

demonstrates excellent reliability, and good sensitivity and specificity with depression diagnoses

(Kroenke et al., 2001). The internal reliability had a Cronbach alpha of 0.89 and the test-retest

reliability was 0.84 (Kroenke et al., 2001).

In a study by van Steenbergen-Weijenburg and colleagues (2010), 197 patients with

diabetes completed the PHQ-9 in an outpatient setting and were interviewed two weeks later

using criterion for major depressive disorder. Afterwards, the sensitivity, specificity and

predictive values and receiver operating characteristic (ROC) curve for the PHQ-9 were

calculated. Results showed a sensitivity of 75.7% and a specificity of 80.0%. Predictive values

for negative test results were 93.4% and positive test result were 46.7%. The ROC was 0.77.

The PHQ-9 showed to be an efficient screening instrument for major depressive disorder in this

sample from a specialized diabetes clinic setting.

In other research conducted by Shu-Fang and colleagues (2014), a descriptive cross-

sectional study of 310 patients with the chronic illness of metabolic syndrome was studied in an

outpatient setting. A collection of tools were administered, including the World Health

Organization Well-being Index (WHO-5), the Hospital Anxiety and Depression scale (HADS),

and the PHQ-9. Construct validity was established through correlation coefficients of PHQ-9

and HADS-D (depression). Those patients suffering from more severe depression had higher

scores of PHQ-9 and HADS-D demonstrating a significantly positive correlation between them.

Therefore, the results of depression of these two scales were consistent, suggesting that the

construct validity was good. Through the use of regression analysis, the PHQ-9 was a significant

predictor of quality of life. This demonstrated that criterion-related validity of PHQ-9 was good.

The Cronbach alpha of the PHQ-9 was 0.80, suggesting good internal consistency of the scale.

Procedures

All potential participants were informed about the study through the SPRINT Study coordinator during their scheduled clinic visits or by a phone call. A script was provided for the SPRINT coordinator (see Appendix G). The SPRINT coordinator provided a list of persons who agreed to be contacted for the study. The PI contacted them to determine a time and place to meet. At that meeting, the PI explained the study, answered any questions, and reviewed the inclusion and exclusion criteria for enrollment.

If inclusion criteria were met and the participant expressed interest, the informed consent was obtained and either data were collected then or during an appointment established for a future date and time. Each participant was asked to sign the consent form which indicated their voluntary consent to participate in the research study, with the understanding that they may withdraw at any time. Each participant was then assigned a study identification number which was written on their data collection instruments. The list of names and identification numbers are secured in a lock file cabinet and are kept separate from the data collection forms and informed consents.

After obtaining informed consent, condition specific and individual data were obtained by the study PI, as prior approval was received from the local SPRINT study to access data from the East Carolina University site (see Appendix A). The participants were then administered the self-reported instruments: self-reported questions on the demographic health tool, the MHLC, and the PHQ-9. Due to the varying educational levels and the potential for medical illiteracy, all instruments were read to the participants by the PI. Directions were given clearly and succinctly for each instrument to decrease the degree of cognitive burden on the participants. The PI assured that each participant understood the structure and design of the tool for their responses to reflect accurate answers. While the PI administered and read, each tool was held in such a way

that it was visible to the participant so that all options, wordage, and scales were visible to provide clarity.

To avoid respondent fatigue, a clear explanation at the onset was given. An explanation of the estimated time, approximately 45-60 minutes to complete the three tools was reviewed. Each tool was rotated to address response fatigue. If needed, rest periods were provided to prevent eye strain, fatigue, or mental exhaustion. These techniques were employed to obtain accurate data and to avoid respondent fatigue that could potentially skew data results.

At the end of data collection, the PI thanked each participant and provided each a $20 gift card for their time. The PI answered any questions and reinforced to each participant that the results of the study will maintain the confidentiality of each participant. The overall results will be shared with participants upon request.

Data Analyses

To prepare the data set for analyses, data cleaning and scrubbing ensued. Missing data points from unanswered items, incorrect answers, or data entry errors were checked by running frequencies on the descriptive data. According to Mertler and Vannatta (2013), careful examination of missing data is essential. By running independent sample t-tests, significant mean differences between groups may be detected. Options for missing data include deleting the data, estimating the missing values, calculating the means using the available data for variables with missing values, and by using a regression approach to estimate the missing values. Content analysis was also done to identify any reverse coded items needed to transform new redefined values to prevent any interpretation errors.

A summary of the sample population, including demographic health attributes and physiological characteristics was completed through the use of descriptive statistics. The International Business Machines Statistical Package for the Social Sciences (IBM SPSS), version

22.0 software, was used to analyze the data. Calculations for all continuous data included measures of central tendency (mode, mean, median), measures of variability (range, standard deviation), measures of relationships (Pearson's correlation or Spearmen rho), and graphic plots for normalcy and frequency distribution. Calculations for non-parametric data included Chi-square test for goodness of fit, Chi-square test for independence, and Mann-Whitney U test.

Any data points that differed greatly or that were distant from other observed data points were reviewed carefully to consider omit outliers. Causes of potential outliers are due to data entry errors, the participant not being a member of the population for which the same is intended, or the participant is different from the remainder of the sample (Tabachnick & Fidell, 2013). Outliers may skew the results of a statistical test and therefore must be carefully examined. The data was visually inspected through frequency distribution or a histogram. If no data entry error was detected, and the outlier was due to an instrumentation error or that the participant was different from the rest of the sample, and will then be dropped from the analysis. However, if it is determined otherwise, then consideration was given to run and report analyses with and without the outliers.

Data Analyses for Specific Aims and Research Questions

The data analyses were outlined for the specific aims and research questions of this research study. Descriptive data were used to provide summaries about the sample. Measures of central tendency, including mean, median, and mode were determined. Measures of variability including standard deviation and the minimum and maximum values of variables, kurtosis and skewness were examined. The internal consistency of all standardized tools was analyzed. The Cronbach alpha should be above .70 (Devellis, 2012). If the Cronbach alpha is low, then the mean inter-item correlation was reported for the items.

1. Aim 1 will describe AA men and women with the diagnosis of HTN who demonstrate self-management behaviors and those who do not demonstrate these behaviors.

   Q-1: What proportions of AA men and women with HTN demonstrate self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence)?

Using descriptive statistics, the proportion of women and men who adhere was checked. Then to determine differences, a Chi-square test using a 2 by 2 table for independence was used. Assumptions have been met in that this is a random sample of independent observations. Three separate Chi-square analyses were done for medication adherence, physical activity adherence, and low sodium diet adherence. The Yates' correction for continuity was examined in the 2 by 2 table. To be significant, the value needs to be .05 or smaller. To examine the correlation coefficient, the phi coefficient can range from 0 to 1, with 1 being a perfect correlation. Effect size will use Cohen's (1988) criteria of .10 for small effect, .30 for medium effect and .50 for large effect.

2. Aim 2 will examine the relationship between condition specific factors, individual factor, self-regulation, social facilitation, and self-management in AA men and women with HTN.

   Q-2: What is the association between condition specific factors (systolic blood pressure, co-morbidities, potassium, creatinine), individual factor (education), self-regulation (depression, locus of control), social facilitation (social support), and self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence) in AA men and women with HTN?

To examine the relationships between these characteristics the Pearson correlation coefficient was used for the continuous variables, and Chi-square was used for categorical variables. The

direction as well as the strength of the relationship between the variables was determined. A positive relationship occurs when high values are associated with both variables, whereas a negative relationship occurs when one variable has a high value that relates to a low value of the other variable. According to Polit and Beck (2012) on a scatter plot, a sloped straight line represents a perfect relationship between variables, making it possible to predict the value of one variable by knowing the value of the second variable.

> Q-3: Do condition specific factors (systolic blood pressure, co-morbidities, potassium, creatinine), individual factor (education), self-regulation (depression, locus of control), and social facilitation (social support), influence self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence) in AA men and women with HTN?

To explore the influence of the 8 independent variables on the dependent variables of adherence, three standard multiple regressions were performed: one for each adherence behaviors (medication, physical activity, low sodium diet). All variables were checked for assumptions related to standard multiple regression, including multivariate normality, linearity, outliers, and homoscedasticity, by examining standardized residual scatterplots. All independent variables were entered into the model at once. The results indicated how well these sets of variables were able to predict self-management behaviors. Initially, the tolerance and variance inflation factor (VIF) was checked for problems with multicollinearity. A tolerance less than .10 or VIF of greater than 10 indicates multicollinearity. Outliers were examined by observing the scatterplot and residual analysis. Standard residuals (ZRESID) were examined for those with a value greater than 2. Decisions were made on including and excluding outliers using the DFBETA. The model was evaluated for R square and adjusted R square. If the model was significant, each

independent variable was examined for significant contribution to the dependent variable. When comparing independent variables contribution, the standardized beta was reported.

> Q-4: When controlling for individual factor (education), do condition specific factors (systolic blood pressure, co-morbidity scores, potassium, creatinine), self-regulation (depression, locus of control), and social facilitation (social support), predict self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence) in AA men and women with HTN?

All variables were checked for assumptions related to multiple regression, including multivariate normality, linearity, outliers, and homoscedasticity, by examining standardized residual scatterplots. In the first block, education was entered (Model 1). The following 7 independent variables were entered into the second block (Model 2). The results will indicate how well this set of variables was able to predict self-management behaviors. Initially, the tolerance and variance inflation factor (VIF) were checked for problems with multicollinearity. A tolerance less than .10 or VIF of greater than 10 indicated multicollinearity. Outliers were examined through observing the scatter plot and residual analysis. Standard residuals (ZRESID) were examined for those with a value greater than 2. Decisions were made on including and excluding outliers using the DFBETA. R square and adjust R square were evaluated for both Model 1 and 2. Additionally R square change was also examined. If the model is significant, each independent variable was examined for significant contribution to the dependent variable. The standardized betas were examined to compare independent variables unique contribution to the dependent variable.

Limitations

Due to the convenience sampling technique of using the parent SPRINT study, the results of this study may only be generalizable to the study participants and not to the general

population. Random sampling was not used in recruiting these outpatient participants, therefore the findings are limited. In addition, the influence of being part of another study may impact the participant's responses on some of the instruments. Because SPRINT is an intervention study on BP control, this may heightened the participants' awareness of their medical management and overall health and as such, affect reporting adherence.

While use of instruments is viewed as an objective research tool, there are limitations. Respondent unreliability by answering in a way that is socially acceptable versus what they think is true, misunderstanding about the structure of the questions, and personal bias are limitations. In addition, responses to instruments can be a disconnect from everyday life, creating an artificial sense of accuracy (Bryman, 2008).

This design of a cross-sectional study is carried out at one point in time and therefore is limited in exploring sequences of events, making it impossible to infer causality. Additionally, changes over time cannot be inferred or assessed in a cross-sectional study design.

Summary

This study was conducted using a cross-sectional correlation non-experimental study design. This study described AA men and women with the diagnosis of HTN who demonstrate self-management through their behaviors of medication adherence, physical activity adherence, and low sodium diet adherence. Through the modified individual and family self-management conceptual model of Ryan and Sawin (2009), the study also examined the relationship between condition specific factors (SBP, co-morbidities, labs including potassium, creatinine), individual factor (education), self-regulation factors (depression, locus of control), social facilitation (social support), and self-management behaviors (medication adherence, physical activity adherence, low sodium diet adherence) in AA men and women with HTN. Approval was received from the

ECU – University and Medical Center IRB office. Participants in the study are from the eastern region of North Carolina and were recruited from a HTN clinic under the parent SPRINT study.

CHAPTER 4: PHYSICAL ACTIVITY ADHERENCE MANSUCRIPT

BACKGROUND, METHODS, AND CONCLUSIONS

This chapter contains manuscript #1 to be submitted for publication regarding research on factors associated with physical activity adherence in African Americans with hypertension. Background is presented about the issue regarding the current state of the science, followed by the methodology of the study design, and ending with results and conclusions.

Abstract

Objective: Using a subset of participants who recently completed a larger clinical trial, this study compared adherence to physical activity (PA) in a sample of 77 African American (AA) adults, aged 55 to 84, with hypertension. The influence of health measures, physiological measures, depression, and locus of control (LOC) on adherence to PA were examined.

Method: Using a cross-sectional descriptive correlational design, AA adults completed a demographic and health tool that included identification of a support person, the amount of perceived support from that person; self-reported adherence to PA on a visual analog scale; the Multidimensional Health Locus of Control Scale; and the Patient Health Question-9 (PHQ-9) Depression Instrument. Physiological data were also collected from the larger clinical trial and included blood pressure (BP); creatinine and potassium serum levels; co-morbidities including diabetes, arthritis, chronic respiratory and chronic kidney disease.

Results: Most of those (63%) with lower PA were less than age 65 and were obese (74%). The only significant univariable relationship with adherence to PA was the PHQ-9 with a moderate negative correlation $(r = -.378; p < .001)$. Using multiple regression, the variables with external LOC explained 26% variance of the adherence to PA $(F = 3.378 [8, 68]; p = .003)$, with creatinine $(p < .05)$, depression $(p < .01)$, and social support for PA $(p < .05)$ significantly influencing the model. Using internal LOC, the model also explained 28% of the variance $(F = 3.361 [8, 68]; p = .003)$. Creatinine level $(p < .05)$, depression $(p < .01)$ and social support for PA $(p < .05)$ significantly contributed to this model as well.

Conclusion: This study identified factors important in PA adherence. Further exploration of serum creatinine levels, depression, and perception of social support as a facilitator of PA

adherence warrants further study to gain more understanding about self-management and AAs

living with HTN.

Background

Hypertension (HTN) is a worldwide epidemic, affecting one third of adults or one billion people. As of 2017, it is estimated that 34% of the adult US population have HTN, up from 29% in 2014 (Benjamin et al., 2017; Yoon, Fryar, & Carroll, 2015). Although much progress has been made in in the treatment of cardiovascular disease (CVD), HTN continues to be a major public health challenge. If left untreated, HTN can lead to heart disease and stroke, which are the leading causes of death in the US (Benjamin et al., 2017; CDC, 2013).

Hypertension disproportionately affects African Americans (AA) in the US at 41.2%, compared to non-AAs at 28% (Nwankwo, Yoon, Burt, & Gu 2013; Yoon et al., 2015). While the majority of the AA population receives health care for HTN management, only 58% have blood pressure (BP) control at their target levels compared to 65% of Caucasians (Benjamin et al., 2017; Ostchega, Yoon, Hughes, & Louis, 2008). A number of physiological traits, environmental characteristics, and behavioral factors contribute to this disparity, all of which contribute to outcomes of early morbidity and mortality (Benjamin et al., 2017; CDC, 2013).

Long standing, uncontrolled HTN leads to end-organ disease resulting in renal failure, vascular associated dementia, and coronary heart disease (Cushman, 2003; Escobar, 2002; Tamura et al., 2010). In AAs, HTN is not only more severe, resulting in more comorbidities and complications, but it also occurs during young adulthood (Aronow et al., 2011; CDC 2013; Ferdinand, 2010; Mozaffarian et al., 2016). The vast majority of AAs (80%) have one or more co-morbidities (Fernandez et al., 2011). A comprehensive approach, including pharmacological therapy and lifestyle management, is vital to control HTN and improve outcomes in AAs.

There is strong seminal clinical research to guide providers in optimizing pharmacological HTN treatments, comparing different antihypertensive agents, prescribing various medication regimes and enhancing medication adherence (Liu et al., 1998; SHEP

Cooperative Research Group, 1991; Staessen et al., 1997; Veterans Administration Cooperative Study Group, 1967). Less is known about lifestyle behaviors and the effect on HTN. In fact, the American College of Cardiology and the AHA guidelines on lifestyle reported that most studies examining the effects of lifestyle changes, physical activity (PA), and diet have not included those with HTN (Eckel et al., 2014). End-organ damage from HTN inhibits adherence to PA, highlighting the need for early lifestyle interventions. Because participation in PA decreases BP (Franks et al., 2004; Whelton, Chin, Xin, & He, 2002), focusing on factors that affect adherence to PA for early self-management of HTN in AAs is important.

Factors associated with adherence to PA include social support (Anderson, Wojcik, Winett, Williams, 2006; Thompson et al., 2003) and education (Alkerwi et al., 2015; Dinwiddie et al., 2015). Conditions associated with HTN may also affect PA adherence. For example increased co-morbidities, or increased symptoms associated with higher BP, such as headache or dizziness, influence the decision to participate in PA (Arnold et al., 2008; Gothe & Kendall, 2016; Schutzer & Graves, 2004). Depression also influences participation in PA and is clearly linked to CVD (Frasure-Smith & Lesperance, 2006; Rogerson, Murphy, Bird, & Morris, 2012). While it is known that depression affects medication adherence (Grenard et al., 2011, Schoenthaler et al., 2015, Wang et al., 2007) in those with HTN, little is known about how depression affects lifestyle behavior of PA in HTN patients with high medication adherence.

Motivation, control or the ability to regulate behavior is also a factor influencing participation and maintenance of PA (Ingledew & Markland, 2008; Peters & Temple, 2008; Ryan & Deci, 2007; Shilts & Dishman, 2013; Teixeira, Carraca, Markland, Silva, & Ryan, 2012). The extent to which people believe they can regulate or have control over their own behavior, locus of control (LOC), can reside either "internal" or "external" to the individual (Wallston & Wallston, 1981). Internal LOC constitutes the belief that health is the result of

one's own action; whereas external LOC is the premise that individual health outcomes are controlled by others, fate, or chance. Health LOC is a predictor of self-care adherence in individuals with known chronic diseases such as asthma and heart failure (Ahmedani, Peterson, Wells, Rand, & Williams, 2013; Rydlewska et al., 2013). Determining if health LOC influences PA adherence, an essential self-care management behaviors in those with HTN, is important in promoting lifestyles interventions to control HTN.

Clearly, the management of HTN requires self-regulation (Chen, Tsai, & Lee, 2009; Patel & Taylor, 2002; Ross, Walker, & MacLeod, 2004). Understanding the multiple factors associated with adherence to PA, especially in AAs, is essential to affect health outcomes. The purpose of this study was to comprehensively examine factors associated with adherence to PA in AAs with HTN who have high pharmacological optimization and medication adherence.

Method

We used a cross-sectional descriptive correlational design to answer the following research questions: (a) What proportion of AAs with HTN demonstrate lower versus higher PA?, and (b) Do systolic BP, co-morbidities, serum levels of creatinine and potassium, education, depression, locus of control, and social support explain PA adherence in AAs with HTN?

After approval from the institution review board, we recruited AAs from a clinic in the rural southeastern region of the US who recently completed a large randomized clinical trial designed to test whether a treatment program aimed at reducing systolic BP to a lower goal than currently recommended would reduce cardiovascular disease (The SPRINT Research Group, 2015). The sample consisted of AAs with a diagnosis of HTN, who were previously enrolled in the parent study for at least one year with a high medication adherence, were English speaking, and were cognitively intact as noted on their medical record. All participants were at least 50

years of age. Exclusion criteria included a diagnosis of cancer, stroke or any known terminal illnesses. Participants meeting eligibility requirements scheduled an appointment to review the study, provide informed consent, and complete the questionnaires. Appointments were held in an outpatient clinic and lasted approximately one hour.

Measures

Participants completed an investigator developed demographic health assessment, a physiological data tool, and standardized instruments. Identification of who provides the most social support was self-reported as an open-ended question. The degree of social support received was self-reported on a Likert scale and measured as: none of the time, a little of the time, some of the time, a good bit of the time, most of the time, and all of the time. A separate visual acuity scale (VAS) scale using a 0-100 mm with anchors on each end ranging from 0 (no support) and 100 mm (support all the time) was used to denote specific social support for PA adherence. Physical activity adherence, defined as any activity that requires energy expenditure for a minimum of 30 minutes at least 4 times a week, was measured using a self-reported 0-100 mm visual acuity scale (VAS-PA) with anchors on each end ranging from 0 (none of the time) to 100 mm (all of the time). The distribution of scores was divided into quartiles to achieve the best measure of central tendency, using the 50th percentile to designate those with high and low PA adherence. The background physiological data were retrieved from the parent clinical trial study and included the most recent systolic BP, body mass index, and potassium and creatinine serum levels. Co-morbidities were also retrieved from the parent trial data, which included categories of CVD other than stroke, chronic respiratory diseases, chronic kidney disease, diabetes, and arthritis.

Instruments

Standardized instruments included: (a) Multidimensional Health Locus of Control (MHLC) Scale, and (b) Patient Health Question-9 Depression (PHQ-9) Instrument. The MHLC is an 18 item, self-reported scale with response choices on a 6-point Likert scale: (1) = strongly disagree, (2) = moderately disagree, (3) = slightly disagree, (4) = slightly agree, (5) = moderately agree, and (6) = strongly agree. It has two 6-item subscales, Internal and External Control, and two 3-item subscales, Doctors and Other People. Each participant had an internal and external LOC score. The Cronbach alpha for this study was 0.78, and is comparable to Wallston's normative data with a reported Cronbach alpha coefficient as 0.67 to 0.77 (Kuwahara et al., 2004; Wallston, 2007).

The PHQ-9 is a self-reported measure of depression recommended by the AHA Panel on Depression and Coronary Heart disease (Litchman et al., 2008). This instrument has a low response burden of 9 items and takes approximately 2-3 minutes to complete. Response choices are on a 4-point Likert scale of 0-3 representing not at all, several days, more than half the days, and nearly every day. The minimal scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression respectively (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 demonstrates excellent reliability (Kroenke et al., 2001) with good sensitivity and specificity for identifying depression with a Cronbach alpha coefficient of 0.89. In this current study, the Cronbach alpha coefficient was 0.82.

Procedures

Of the 265 clinic patients who recently completed the larger randomized clinical trial, there were 111 eligible AA participants. Reasons for not participating in this study included:

unable to be reached by telephone (*n=24*), scheduling conflicts (*n=5*), no interest (*n=3*), and family illnesses (*n=2*). Each of those agreeing to participate and who met the eligibility requirements attended a session with the principal investigator (PI) who provided detailed information regarding the study, answered questions, and obtained informed consent. A total of 77 participants were enrolled in the study and data collection was conducted by the PI in one session.

Data Analysis

An a priori power analysis using nQuery Advisor indicated a sample size of 69 would provide 80% power, testing that $R^2 = 0$ for eight independent variables with normally distributed covariates at 0.05 significance (Gatsonis & Sampson, 1989). After data were verified for accuracy, frequencies were examined to identify missing data points. Background demographic data were analyzed using univariate and descriptive statistics. Discrete variables were summarized with percentages, and continuous variables were summarized with means and standard deviations. Description of the sample was organized into two categories, lower and higher PA adherence.

The data were visually examined using box plots and scatter plots, and no outliers were identified. Only one variable, depression, required square root transformation to meet the assumption of normality (Tabachnick & Fidell, 2013). Preliminary analyses indicated no other violations of assumptions of normality, linearity and homoscedasticity. All collinearity statistics were assessed and accepted. Pearson's product-moment correlation coefficients were calculated to describe the strength and direction of the linear relationships between the continuous variables.

A multiple linear regression analysis was performed to examine whether the independent variables (systolic BP, number of co-morbidities, serum creatinine and potassium levels, education, depression, locus of control, and social support) explained the variance in adherence to PA. To account for the MHLC, three separate regressions were conducted: one with internal LOC, one with external LOC and the third with both internal and external LOC scores. All data were analyzed using International Business Machines Statistical Package for the Social Science (IBM SPSS) software, version 22.0 (SPSS, Inc., Chicago, IL).

Results

The majority of the sample were female ($n = 50$; 65%). Ages ranged from 55 to 84 with a mean of 66 ($SD = 7.68$) years. Thirty four percent ($n = 26$) had a systolic BP over 140 mg/Hg despite reporting high medication adherence and pharmacological optimization through the SPRINT trial. Those scoring 82 (range 7-100) and above were considered high adherence to PA. When examining lower PA group (less than 82), a greater number were less than age 65 ($n = 24$; 63%), and were obese ($n = 28$; 74%). See Table 1. The only significant difference in the two groups was age ($X^2 = 7.82$ [2], $p = .02$). The VAS-PA score averaged 74.68 ($SD = 25.68$), with a range of 7 to 100 (Table 2). The only significant univariable relationship with VAS-PA was the PHQ-9 with a moderate negative correlation ($r = -.294$; $p < .001$). See Table 2.

All eight variables (systolic BP, number of co-morbidities, serum levels of creatinine and potassium, education, depression, locus of control [Internal], and social support) were entered into Block 1 and explained 28% of the variance in the adherence to PA ($F = 3.361$ [8, 68]; $p = .003$). Only creatinine level ($p < .05$), depression ($p < .01$) and social support for PA ($p = .05$) significantly contributed to the model (Model 1 in Table 3). This regression was repeated using the same variables for Model 2, except external LOC was used instead of internal

LOC. This model also explained 28% of the variance in the adherence to PA ($F = 3.378$ [8, 68]; $p = .003$). Serum creatinine level ($p < .05$), depression ($p < .01$) and social support ($p < .05$) significantly contributed to the model (Model 2 in Table 3).

Because PHQ-9 was a significant predictor variable in both models, we examined the categories of depression and the VAS-PA score. Because only 5 participants indicated depression as moderately severe or severe, we examined difference in VAS-PA scores by categories of no depression, mild depression, and moderate depression, and noted a significant difference ($F = 4.707$ [269], $p = .012$; $Eta^2 = .12$). Post hoc analyses indicated that the mean score of the no depression category ($M = 88.26$, $SD = 18.97$) was significantly different from the mildly depressed category ($M = 70.24$, SD 27.71) and the moderately depressed category ($M = 66.83$, $SD = 23.31$). There was no difference between the categories of mild and moderate depression.

The 5 participants who scored moderately severe or severe were assessed further. Documentation shows that these findings were present prior to enrollment in our study, and the participants had been under the care of a provider for management of their depression without complications.

Discussion

Although studies on BP management and medication adherence are clinically relevant, the overall management of HTN and the chronicity of the disease warrant exploring self-management strategies such as PA adherence. This was evident in our study where one third of the sample had systolic BP over 140 despite reporting high medication adherence. Our study explored a specific vulnerable population, AAs who are prone to more severe complications from HTN. Interestingly, those less than 65 years of age demonstrated the lowest PA. This may

be reflective of adults staying in the workforce longer, which may cause stress or time constraints that hinder incorporating PA into their lifestyle. Considering those that retired at age 65, they may have had more time to focus on structured activities or to be more physically active (Evenson, Rosamond, Cai, Diez-Roux, & Brancati, 2002; Nuttman-Schwartz, 2004). Williams and colleagues (2009) report that motivation to engage in PA is reinforced among older adults for preventative measures, which may influence behavior as well.

The importance of PA in those with HTN is well documented (Alkerwi et al., 2015; Eckel et al., 2014; Teixeira et al., 2012; Whelton et al., 2002). The only physiological variable influencing PA in this study was creatinine serum levels. The participants were a subgroup of the parent SPRINT trial, where the inclusion of chronic kidney disease patients was one of the specific cohorts of interest. Serum laboratory values were assessed regularly. Thus, elevated creatinine levels may indicate a stage of chronic kidney disease with associated symptoms of fatigue and weakness that could negatively influence adherence to PA. Although no correlations were seen between systolic BP, serum potassium levels, and PA, these physiological markers can fluctuate and may compound symptoms in the presence of co-morbidities. These symptoms associated with comorbidities can ultimately impact attitude, and emotion, and affect adherence to PA. In our study, a correlation was demonstrated between depression and adherence to PA. These results are similar to other studies in populations with chronic diseases such as heart failure, asthma (Chapman, Perry, & Strine, 2005; Clarke & Currie, 2009; Goldney et al., 2003). This is the first study examining depression as a factor influencing PA adherence in AAs with HTN with a high medication adherence. Turner and Kelly (2000) emphasize that the emotional dimensions of chronic conditions are often overlooked and depression is difficult to diagnose. A challenge is managing both clinical and psychological aspects of HTN. In our study, 8% of the sample scored in the moderate to moderately severe range. However, 30% reported a range of

mild depressive symptoms. Because those with no depression reported significantly higher adherence to PA than those participants with mild or moderate depression, health care providers should be diligent in screening for depression at every visit.

Although the literature is limited in studies examining educational level, Dinwiddie and colleagues (2015) suggest that educational attainment may be a powerful predictor in the inflammation pathway in CVD. Non and colleagues (2012) explored the association between education and BP across racial groups and found that for each year of education, there was an associated drop in BP. Similarly, Pickett and colleagues (2014) reported that AAs with HTN who had more than 12 years of education demonstrated higher adherence in PA and weight control self-care behaviors. These results differ from our study, as educational levels did not show a correlation with PA adherence. These differing results may be related to the sample size and future studies with a larger sample size are warranted.

As previous studies have demonstrated a correlation between depressive symptoms and social support with self-management of HTN (Bell, Thorpe, & LaVeist, 2010; Klymoko, Artinian, Peters, & Lichtenberg, 2011), this relationship was also exhibited in our two models. Depression was consistently significant in both models, along with social support. Participants completed the VAS based on their belief of their social support to participate in PA. Belief of social support may be a stronger predictor of adherence to PA than the actual presence of social support. Future research is needed to understand how belief and perception of social support influence self-management.

Our study did not find LOC or comorbidities as influencing variables for adherence to PA. Contrary to our findings, studies of those with asthma, heart failure, and diabetes found a low adherence to treatment regimens and self-management associated with external locus of control. This could be explained due to the prolonged asymptomatic state of HTN. One study

found that medical comorbidities are frequently a barrier to PA (Mansyur et al., 2013), however this study did not find comorbidities influenced adherence to PA. Because our study only included five co-morbidities, we may not have captured those co-morbidities or the interaction of co-morbidities that most affect adherence to PA. Future studies need to include all aspects of co-morbidities.

Limitations of this study include the use of a convenient sample of participants from a larger parent study. These participants had been under close monitoring and care of a research team of healthcare professionals who focused on their total care. This may have skewed their adherence responses, and increased their compliance to therapy due to regular scheduled study visits. Physiological data were collected from the parent clinical trial and may not reflect the dynamic nature of these variables. A larger sample size is advocated and follow-up of this cohort at a later point in time may provide more relevant findings.

The management of HTN requires self-regulation (Chen et al., 2009; Patel & Taylor, 2002; Ross, Walker, & MacLeod, 2004). Those with HTN can be asymptomatic for decades (CDC, 2016; Rosendorff, 2013). This presentation is different from other chronic diseases where clinical symptoms motivate patients to seek health care and to adhere to treatment regimens for symptom relief. The silent aspect of HTN presents challenges in recognizing the need for lifestyle behavior change to manage their HTN. This study examined self-reported adherence to PA in AAs in a rural geographic location. This was a unique population as part of the SPRINT trial, in that they had high pharmacological optimization and medication adherence, and consistent, health provider contact. The findings from this study provide a foundation for understanding factors associated with PA adherence in AA with HTN and high medication adherence.   Further studies are needed to target interventions increasing adherence to PA and preventing the negative outcomes associated with long term HTN in AAs.

Although the current study focused on AA with HTN, findings may be applicable to other chronic conditions that benefit from PA, such as diabetes, obesity, asthma, and arthritis. Factors that positively effect and negatively influence adherence must be taken into consideration when planning and managing comprehensive care for individuals.

Conclusion

This study described and evaluated factors influencing adherence to PA in AA patients with hypertension. Although multiple techniques exist to measure actual PA of various intensities, they can be costly and not easily accessible to populations living in rural areas. This study used a VAS scale for self-reporting that measured participant's self-perceived adherence to PA. In addition, this cross-sectional study of AA men and women suggest self-reported adherence to moderate PA is correlated with depression and serum creatinine levels, but not to systolic BP, co-morbidities, serum potassium levels, educational level, social support or locus of control. When internal locus of control was examined, self-reported adherence to moderate PA correlated with depression, serum creatinine levels, and to perceived amount of social support. This study may ultimately further identify variables, those that assist and those that are barriers. Both which can contribute to new and effective tailored patterns of the appropriate dose, to achieve the overall goal of enhancing adherence. Further research is needed with larger cohorts focusing on PA adherence in various populations. Studies such as this can serve as a baseline for follow-up longitudinal studies to examine PA adherence in the self-management of HTN in the AA population to reduce overall CV morbidity and mortality.

Table 1

Demographic Statistics by Physical Activity (PA) Adherence (N=77)

Variable	Lower PA[a] n (%)*	Higher PA[b] n (%)*
Age (years) **		
<65	24 (63)	13 (33)
65-74	8 (21)	19 (49)
75+	6 (16)	7 (18)
VAS Med Adherence *M* [*SD*]	92.9 [11.31]	94.7 [8.06]
Gender		
Female	27 (71)	23 (59)
Male	11 (29)	16 (41)
Marital Status		
Single	5 (13)	4 (10)
Married/Cohabitate	15 (40)	22 (56)
Divorced	10 (26)	8 (21)
Widowed	8 (21)	5 (13)
Education		
< High School	7 (19)	6 (15)
High School Graduate	13 (34)	8 (21)
Some College	13 (34)	8 (21)
College Graduate	5 (13)	17 (43)
Body Mass Index (kg/m^2)		
Under <19	0 (0)	1 (3)
Ideal 19 - 24.9	2 (5)	4 (10)
Over 25 - 29.9	8 (21)	16 (41)
Obese ≥30	28 (74)	18 (46)
Co-Morbidities		
CVD other than HTN/stroke	25 (66)	27 (69)
Respiratory Disease	18 (47)	14 (36)
Chronic Kidney Disease	11 (29)	8 (21)
Diabetes	4 (11)	2 (5)
Arthritis	11 (29)	9 (23)
Abnormal Lab Values		
Creatinine	5 (13)	5 (13)
Potassium (no abnormal values)		

* rounded percentages;   ** X^2 = 7.82 (2), *p* = .02 ; [a]n = 38, [b]n = 39

Table 2

Descriptions and Correlations for VAS-PA and Continuous Predictor Variables (N=77)

Variable	*M*	*SD*	1	2	3	4	5	6
VAS-PA Measure (Range 7-100)	74.68	25.68	-.071	-.176	.015	-.294**	.105	-.040
Predicator variable								
1. Systolic BP	132	14.74	-	.025	-.023	-.025	-.094	.203
2. Creatinine	1.16	1.04		-	.302**	-.131	.094	.354**
3. Potassium	3.98	0.45			-	.059	-.162	.075
4. PHQ-9	3.35	4.06				-	-.336**	-.075
5. LOC-Internal	29.25	5.81					-	.174
6. LOC-External	13.44	7.39						-

BP = Blood Pressure
PHQ-9 = Patient Health Questionnaire – Depression
LOC = Locus of Control
VAS-PA = Visual Acuity Scale – Physical Activity

p < .05; **p* < .001

Table 3

Multiple Regression Summary for Variables Predicting Adherence to Physical Activity (N=77)

Variable	Model 1- Internal LOC			Model 2 - External LOC		
	B	*SE B*	*ß*	B	*SE B*	*ß*
Systolic BP	-.05	0.18	-.03	-.06	0.18	-.03
Co-morbidities	-.97	2.23	-.05	-.87	2.23	-.04
Creatinine	-6.37	2.81	-.26*	-6.66	2.92	-.27*
Potassium	8.99	6.44	0.16	9.12	6.32	0.16
Education	2.69	2.59	0.11	2.96	2.71	0.12
PHQ-9	-8.17	2.37	-.38**	-8.15	2.27	-.38**
Social Support	3.93	1.58	0.27*	3.87	1.59	0.26*
LOC-Internal	-.09	2.97	-.003			
LOC-External				.79	2.49	0.04
R^2		.283			.284	
F		3.361			3.378	
p		.003			.003	

*p< .05; ** p < .01

CHAPTER 5: ADHERENCE TO A LOW SODIUM DIET MANUSCRIPT

SIGNIFICANCE, STUDY DESIGN, FINDINGS, AND RECOMMENDATIONS

This chapter contains manuscript #2 to be submitted for publication regarding research on adherence to low salt diet in African Americans with hypertension. The significance of this issue is discussed in the introduction, followed by a description of the study methods and findings. The article ends with implication supporting the study conducted by this researcher.

Abstract

Background: The identification of adherence determinants to self-management behaviors among African American (AA) adults with hypertension (HTN) is essential in affecting health. Adherence to a low salt diet is one key factor in the successful management of HTN.

Objective: The present study aimed to identify health and physiological measures, along with depression and locus of control (LOC) measures, affecting adherence to a low salt diet. The sample consisted of AA participants (ages 55 to 84) who were a subset of a large clinical trial.

Design: A cross-sectional descriptive correlation design was employed.

Methods: Participants (N=77) were recruited from an outpatient clinical trial. Physiological data were collected along with a general demographic/health questionnaire, including identification of a support person, and the amount of support received from that person. Self-reported adherence to a low salt diet was reported on a visual analog scale. Depressive symptoms using the Patient Health Question-9 Depression (PHQ-9) and the LOC orientation using the Multidimensional Health Locus of Control scale were also collected.

Results: Most of those with lower adherence to a low salt diet were female ($n = 27$; 73%). The only significant univariable association with low salt diet adherence was the PHQ-9 with a moderate negative correlation ($r = -.294$; $p < .01$). Both multiple regression models significantly influenced adherence to low salt diet, with model 1 depicting Internal LOC explaining 23% of the variance in adherence (F = 2.599 [8, 68]; p = .015), and model 2 explaining 24% of the variance in adherence (F = 2.667 [8, 68]; p = .013). Serum potassium level *(p < .01)* and social support *(p < .01)* significantly contributed to both internal and external LOC models.

Conclusion: Further exploration of low salt diet adherence issues with serum potassium levels, social support, and depression warrants further research in the self-management of HTN with the goal of slowing the progression of this silent disease.

According to the American Heart Association (AHA), cardiovascular disease (CVD) and cancer are the number one causes of mortality in the US (AHA, 2016; Hivert, 2016). Hypertension (HTN) is a risk factor for CVD and is the most common diagnosis in the US in primary care settings, with over 34 million office visits (CDC, 2012). In the US alone, 78 million adults have HTN (Nwankwo, Yoon, Burt, & Gu, 2013). The progression of the disease leads to end organ damage resulting in heart failure, stroke or transient ischemic attacks, chronic kidney disease, peripheral vascular disease, and retinopathy (Kaplan & Victor, 2015).

African Americans (AA) are particularly vulnerable to the development of HTN. They develop HTN at a younger age, respond differently to medical therapy, and have more complications (Aronow et al., 2011; CDC 2013; Ferdinand, 2010; Mozaffarian et al., 2016). Reasons for this vulnerability have been attributed to genetics, along with environmental factors; including the slavery HTN hypothesis which states native African slaves possessed the ability to conserve salt as a protective mechanism to ward off diseases and the effects of dehydration in arid environments (Kaplan & Victor, 2015). According to this hypothesis, this adaptive mechanism resulted in higher incidences of HTN in AAs due to the high sodium intake in the American diet compared to the African diet.

Regulation of blood pressure (BP) is complex consisting of vascular, neurological and hormonal components. Increased intake of sodium affects these components and reduces the ability of the kidneys to remove water, resulting in higher BP. If not monitored or self-managed, this progressive state can lead to end organ damage, such as chronic renal failure. The relationship and influence of sodium on BP is well documented (Chobanian & Hill, 2000; Jones, 2004; Hollenberg, 2006). The original hallmark Dietary Approaches to Stop Hypertension (DASH) study results demonstrated that a diet rich in fruit, vegetables, whole grains and low-fat dairy foods was protective against HTN, and when adding the component of a low salt diet (1500

mg sodium), BP was lowered even more (Sacks et al., 2001; Vollmer et al., 2001). In analyzing specific racial groups within the study, AA participants benefited by showing significant reductions in BP when the DASH diet with a low salt intake was followed.

The average American diet consists of an intake of 3,400 mg of sodium per day (US-FDA, 2016). Observational and interventional studies have indicated that limiting salt intake in hypertensive patients can substantially reduce systolic blood pressure (BP) 3.7-7.0 mm Hg and diastolic BP 0.9-2.5 mm Hg (He & MacGregor, 2009; O'Donnell, Mente, & Usuf, 2014; Pimenta et al., 2009; Swift, Markandu, Sagnella, He, & MacGregor, 2005). Although the evidence is clear regarding the need to limit sodium intake, understanding self-management behaviors surrounding lifestyle behaviors, such as food choices, dietary patterns, and personal preferences are needed.

Lifestyle behaviors and dietary salt intake have been linked as factors contributing to raising BP even more in patients with existing HTN. The importance of these lifestyle modifications have been identified by the AHA and include: eating a better diet with reduced salt intake, enjoying regular physical activity, maintaining a healthy weight, managing stress, avoiding tobacco smoke, complying with medication prescriptions, limiting alcohol intake, and understanding hot tub safety (AHA, 2016). Additionally, understanding the beliefs of individuals on how events and outcomes are influenced, whether through their own internal power or outside forces, is an added factor to consider.

A comprehensive approach exploring HTN management is needed. Understanding beliefs about care could provide insight and cultivate a sense of responsibility for personal health in preventing complications of HTN (Ryan & Swain, 2009). In addition to the physiological components of each unique person, psychosocial components to capture the lifestyle of living with HTN are essential. Self-management related to these components include factors such as

systolic BP, numbers and types of co-morbidities, serum levels of creatinine and potassium, educational level, assessment of mood or depression, assessment of belief system regarding locus of control, and understanding of social support systems. Acquiring all these components can provide information to further the understanding of individual self-management needs of those living with HTN. The main objective of this study was to describe AAs with the diagnosis of HTN who demonstrate self-management behaviors associated with adherence to a low salt diet and to examine factors associated with the salt diet adherence levels.

Methods

Participants and procedure

Approval was obtained from the University and Medical Center Institutional Review Board (UMCIRB) in Greenville, North Carolina. The sample consisted of AAs with a diagnosis of HTN (N=77) who were previously enrolled and completed a large randomized clinical trial examining whether a treatment program aimed at reducing systolic BP to a lower goal than currently recommended would reduce cardiovascular disease in patients over the age of 50 (The SPRINT Research Group, 2015). The inclusion criteria for our study included those patients that were previously enrolled in the SPRINT study for a minimum of one year, who spoke English, and had no cognitive deficits as noted on their medical record. The exclusion criteria included a diagnosis of cancer or any terminal illnesses.

Those eligible (N = 111) were contacted by the clinic nurse to determine their interest in the study with 69% agreeing to participate.   Appointments were then scheduled in an outpatient clinic where the study was explained and informed consent obtained. Each participant received a gift card to thank them for their time.

A cross-sectional correlation design was used to address the following research questions: (a) What proportion of AAs with HTN exhibit high versus low adherence to a low

salt diet?, and (b) Do systolic BP, co-morbidities, serum levels of creatinine and potassium, education, depression, locus of control (internal or external), and social support explain adherence to a low salt diet in AAs with HTN?

Measures

Investigator developed tools and standardized tools were used. The investigator developed tools included a demographic health assessment intake and a physiological data collection tool. The two standardized tools used to collect and operationalize the variables were: (1) Multidimensional Health Locus of Control (MHLC) Scale and (2) Patient Health Question-9 Depression (PHQ-9) Instrument.

The demographic health assessment questionnaire included characteristics of interest (age, sex, education, marital status). The tool also included an open-ended question for identification of the person who provided the most support for adherence to a low salt diet and a rating question using a Likert scale of 0 to 5 (none of the time to all of the time) for the perceived degree of support received from this person. The questionnaire also included a measurement item for the participant's adherence to a low salt diet. This was self-reported through the use of a 0-100mm visual acuity scale (VAS), with 0 indicating no support and 100 indicating support all the time. The score distribution along the continuum was divided into quartiles and to achieve central tendency, the 50th percentile within the middle quartile was the marker used to designate low versus high score for adherence to a low salt diet. A low salt diet for our study was defined as a diet restricted to foods naturally low in sodium content and prepared without added salt in accordance with the American Heart Association guidelines to no more than 2,300 milligrams a day (Van Horn et al., 2016). The physiological data collection tool included participant's most

recent BP, height, weight, co-morbidities, and serum laboratory values of creatinine and potassium.

The MHLC is a self-reported scale with 18 items. Response choices are on a 6-point Likert scale representing strongly disagree to strongly agree. It has two 6-item subscales: Internal and External, along with two 3-item subscales: Doctors and Other People. The score on each subscale is the sum of the values circled for each item on the subscale. All of the subscales are independent of one another with reports of no items needing reversal before summing (Wallston, 2007). Based on their scores, each participant received a total score for internal locus of control (LOC) and external LOC. The Cronbach alpha for this study was 0.78. This is consistent with reported Cronbach alpha coefficients of 0.62 to 0.76 (Kuwahara et al., 2004; Wallston, 2007).

The PHQ-9 instrument is a self-reported measure of depression that has been recommended by the American Heart Association Advisory Panel on Depression and Coronary Heart disease (Litchman et al., 2008). The 9-item instrument assess the frequency of symptoms and has a low burden response time taking approximately 2-3 minutes to complete. Response choices are on a 4-point Likert scale of 0-3 representing not at all, several days, more than half the days, and nearly every day respectively. The minimal scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression respectively (Kroenke, Spitzer, & Williams, 2001). It demonstrates excellent reliability and good sensitivity and specificity with depression diagnoses (Kroenke et al., 2001). It has excellent internal reliability with a Cronbach alpha coefficient of 0.89 (Kroenke et al., 2001). In our study, the Cronbach alpha coefficient was 0.82.

Data Analyses

For eight independent variables (systolic BP, co-morbidities, serum creatinine and potassium levels, educational level, social support, depression, and LOC) with normally distributed covariates at 0.05 significant, an a priori analysis determined a minimum sample size of 69 would provide 80% power (Gastonis & Sampson, 1989). Data were verified for accuracy, checked for missing data points, and examined using box plots and scatter plots. There were no missing data points or outliers. Square root transformation was required of one variable, PHQ-9 score, to meet the assumptions of normality (Tabacknick & Fidell, 2013).

All data were described by two category outputs of lower and higher adherence to a low salt diet. Frequency distributions and percentages for discrete variables were used to summarize the characteristics of the participants. Descriptive statistics were computed to describe the sample population including range, mean, and standard deviation for the continuous variables. The Pearson product-moment correlation coefficients were used to determine the strength of the linear correlation between the continuous variables.

The relationship between the independent variables (systolic BP, co-morbidities, serum levels of creatinine and potassium levels, educational level, social support, depression, and LOC) and the outcome variable of adherence to a low salt diet VAS scale, was explored through a multiple linear regression analysis. International Business Machines Statistical Package for the Social Science (IBM-SPSS software, version 22.0 SPSS, Inc., Chicago, IL) was used to analyze all data.

Results

Contact was made with 87 of the eligible AA participants and 77 were enrolled. The sample ranged from ages 55 to 84, with the majority being female ($n = 50$; 65%). In reporting

marital status, "married/cohabitate" was the highest ($n = 37$; 48%) when compared to the other categories of single, divorced, or widowed. The majority of female participants had lower adherence to a low salt diet ($n = 27$; 73%) compared to male participants who were relatively equal in lower ($n = 10$; 27%) and in higher ($n = 17$; 43%) adherence to a low salt diet. Other descriptive data categorized by low salt diet adherence are presented in Table 1.

The VAS-low salt diet adherence mean score was 72.16 ($SD = 27.32$) with a range of 0 to 100. The only variable significantly correlated with VAS-low salt diet adherence was the PHQ-9 with a moderate negative correlation ($r = -.294$; $p < .01$). All continuous predictor variables are presented in Table 2.

To examine each LOC predictor variable, the other seven dependent variables (systolic BP, co-morbidities, serum creatinine and potassium levels, educational level, social support, and depression) were entered into two separate regressions. Internal LOC was entered into the first regression and external LOC was entered into the second. Model 1 (Table 3) depicting Internal LOC explains 23% of the variance in adherence to a low salt diet ($F = 2.599$ [8, 68]; $p = .015$). Of the eight dependent variables, serum potassium level ($p < .01$, and social support ($p < .01$) significantly contributed to the model. The regression was repeated using external LOC (Model 2) using the same variables. This model explained 24% of the variance in adherence to a low salt diet ($F = 2.667$ [8, 68]; $p = .013$). Again serum potassium level ($p < .01$), and social support ($p < .01$) significantly contributed to the model.

Discussion

Large population based studies have extracted various factors that contribute to cardiovascular health (Kearney et al., 2005; Sowers, Epstein, & Frohlich, 2001; Van Gaal, Mertens, and De Block, 2006). Based on the outcomes of these studies, various

pharmacological, clinical, and educational interventions have been introduced. Despite the availability of a multitude of medications along with screening and educational tools, poor health metrics such as obesity and HTN remain prevalent, especially in the AA population (Aronow et al., 2011; CDC 2013; Ferdinand, 2010; Mozaffarian et al., 2016). In this study, participants were a subset of a larger clinical trial and were followed by providers managing their HTN. Despite this close follow-up, one third of patients self-reported nonadherence. Thus, lifestyle characteristics and self-management behaviors warrant closer investigation. To address this issue, this study focused on measuring predictors of adherence to a low sodium diet in a vulnerable population who has a disproportionate from the long-term effects of HTN.

Studies have clearly shown that adherence to a low salt diet directly reduces systolic BP in patients with HTN (He & MacGregor, 2009; O'Donnell, Mente, & Usuf, 2014; Pimenta, et al., 2009; Swift et al., 2005). In our study, a greater proportion of men reported higher adherence to a low salt diet, while a higher percentage of women indicated a lower adherence to a low salt diet. These findings are different from other studies which have shown both women and men with higher adherence levels to a low salt diet (Chung, Moser, Lennie, Worrall-Carter, & Bentley, 2004; Chung et al, 2007), and similar to other study findings with women, not men, indicating lower adherence levels (Chung, Park, Frazer, & Linnie, 2016; Nunes, Anderson, Greene, Ikizler, & Cavanaugh, 2015). These differences may be attributed to primary diagnoses, number and types of co-morbidities and medications. Marital status may be another influential factor. The majority of our sample was classified as married or cohabitating, and we did not seek to identify the primary person responsible for meals in terms of shopping, planning, and meal preparation. Also, the majority (74%) who had lower adherence to a low-salt diet were obese (BMI over 30 kg/m^2), and 21% (BMI = 25-29.9 kg/m^2) were classified as overweight. This finding is worrisome, as recent studies have shown an association between salt intake and

obesity (Larsen et al., 2013; MacGregor 2016; Ma, He, MacGregor 2015). A one gram increase

in salt intake correlated with a 25% increase in the risk of obesity (MacGregor 2016; Ma, He,

MacGregor 2015). Dietary intake not only meets the nutritional needs for AAs, but also the

social, communal and family household needs as well. Cultural considerations of AAs' dietary

practices, including purchasing and preparing meals, is important to include in future studies

examining self-management strategies for adherence to a low-salt diet.

Depression has been shown to affect patients' adherence to preventive measures (Fan,

Mallawaarachchi, Gilbertz, Li, & Mokdad, 2010; Kim, Han, Hill, Rose, & Roary, 2003; Song,

2009; & Wang et al., 2002). Similar to other studies, we noted that increased depressive

symptoms were significantly correlated with decreased adherence to a low salt diet.

Interestingly, depression did not maintain its significance in our multi-factorial model. Further,

systolic BP, serum levels of creatinine and potassium, and LOC did not correlate with self-

reported adherence to a low salt diet. Systolic BP and laboratory values may not have correlated

because these participants were part of a larger clinical trial and were followed closely. We gave

careful consideration when selecting our participants from the SPRINT study. As participants in

the SPRINT trial, each person had received their anti-hypertensive medications for free and had

regular health care provider visits with pharmacological optimization of their medications. Thus,

barriers associated with medication adherence were minimized as reflected in their high VAS-

medication adherence scores.

On initial examination of our correlational analysis, creatinine associated significantly

($p < .01$) with potassium and with external LOC (Table 2). The creatinine level of one

participant was seven times the normal. Accuracy of this lab value was verified. When the

analysis was run without this participant, there was no significant correlation of creatinine to

potassium or external LOC. Excluding this participant in the final regression model did not

change the results.

There was a negative association between internal LOC and depression. Multiple studies

with younger adults show conflicting results when reporting correlations with depression and

either internal or external LOC (Afifi, 2007; Twenge, Shang, & Im, 2004; Zawawi, 2009).

Wang and colleagues (2002) found that depression was significantly correlated to medication

adherence, with a strong association of increased adherence to external LOC. However, there

are limited studies examining the relationship between LOC and depression in older patients

with HTN.

Of all the variables of interest in our regression analysis (systolic BP, co-morbidities,

serum levels of creatinine and potassium levels, educational level, social support, depression, and

LOC), the only physiological variable that was significantly associated with adherence to a low

salt diet in both models (internal and external LOC) was serum potassium. Fang and colleagues

(2000) found an increase in cardiovascular mortality among subjects with moderately increased

serum potassium levels while using diuretics. However, serum potassium levels in our sample

were within the normal range of 3.1 to 5.5 mEq/L. It is well known that an increase in dietary

sodium increases renal excretion of potassium (Kaplan & Victor, 2015), and this may explain our

findings. Decreased potassium levels have been associated with depression (Kaplan & Victor,

2015; Widmer et al., 2008). While our study did not note a relationship between potassium and

depression, potassium was a strong predictor of adherence to a low sodium diet. These findings

are intriguing and warrant further study.

Epstein and colleagues (2012) found that AAs had lower adherence to the DASH diet,

however they did not find social support, LOC, or depression as a predictor of adherence.

Conversely, we found that social support significantly influenced self-adherence to a low salt

diet in both models: those who considered circumstances are controlled from within themselves (internal LOC) and those who considered control is from outside themselves (external LOC). These findings may be related to our participant's self-selection and identification of their support person. It is not known whether their support person lived within the household, nor is it known how often the support person interacted with each participant. Future studies examining social support and self-management should include these variables to more comprehensively understand the influence of social support on adherence to a low salt diet in AAs with HTN.

Because our study was cross-sectional, it is not known if the self-perceived adherence taken on the given day in our study is reflective of adherence over time. Studies have shown that adherence is influenced by ever-changing personal and situational factors (Sinehotta, Schwarzer, Scholz, & Schuz, 2005; Spire et al., 2002). What is known is that HTN is often unnoticed and unmanaged until the later progressive stages. Early intervention is essential to affect the negative outcomes of HTN in the AA population. Self-management is essential to manage HTN, as pharmacological interventions alone are not sufficient to control HTN. It is essential that we continue to examine self-management in the AA population with HTN to improve their health and decrease their disparate outcomes.

Limitations

Because of the cross-sectional study design, causality cannot be inferred. This study was a cohort of AAs living in rural eastern North Carolina and may not represent the nationwide AA population. Further, our sample of participants were part of a larger parent clinical trial. Although this provided a cohort of participants with monitored BP readings on a stable medication regimen without experiencing side effects, this may have introduced bias into our study, as it was not a random sampling. Acceptability bias must also be considered, in that the

participants may have over-reported their low salt diet adherence levels. All participants stated the positive impact of being in the SPRINT trial and may have reported favorable responses to show loyalty to the parent clinical trial.

Despite definitions, descriptions, and examples being consistent and clear about LOC, there could be variance in the interpretation. Further, because these participants were part of a larger clinical trial, their experiences and relationships with the study personnel may have influenced their responses. Likewise, participants that are aware of what researchers are studying may demonstrate changes in behaviors and responses, similar to the Hawthorne effect (McCambridge, Butor-Bhavsar, Witton, & Elbourne, 2011; McCambridge, de Bruin, & Witton, 2012). Last, data were obtained through self-reporting VAS, and responses were not validated for adherence to a low salt diet through physiological measures. Thus, recall bias may have occurred.

Conclusion

We examined the characteristics and factors influencing a cohort of AAs with HTN and their adherence to a low salt diet. Increasing awareness of factors affecting adherence to a low salt diet is an essential first step for individuals to self-manage HTN. However, other challenges exist due to the American diet and the amount of salt in prepared foods from food manufacturers. Future studies should consider the influence of the food industry, public policies, and health care professionals on dietary self-management. Findings from this study inform the development of targeted interventions to increase dietary self-management in AA men and women with HTN.

Table 1

Demographic Statistics by Low Salt Diet Adherence (N=77)

Variable	Lower Adherence[a] n (%)*	Higher Adherence[b] n (%)*
Age (years)		
<65	18 (49)	19 (48)
65-74	13 (35)	14 (35)
75+	6 (16)	7 (17)
VAS Med Adherence *M* [*SD*]	91.7[11.27]	95.9 [7.78]
Gender		
Female	27 (73)	23 (57.5)
Male	10 (27)	17 (42.5)
Marital Status		
Single	4 (11)	5 (12)
Married/Cohabitate	18 (49)	19 (48)
Divorced	9 (24)	9 (23)
Widowed	6 (16)	7 (17)
Education		
< High School	6 (16)	7 (18)
High School Graduate	11 (30)	10 (25)
Some College	11 (30)	10 (25)
College Graduate	9 (24)	13 (32)
Body Mass Index (kg/m^2)		
Under <19	0 (0)	1 (3)
Ideal 19 - 24.9	3 (5)	2 (5)
Over 25 - 29.9	8 (21)	17 (42)
Obese ≥30	26 (74)	20 (50)
Co-Morbidities		
CVD other than HTN/stroke	21 (57)	31 (78)
Respiratory Disease	14 (38)	18 (45)
Chronic Kidney Disease	10 (27)	9 (23)
Diabetes	4 (11)	2 (5)
Arthritis	11 (30)	9 (23)
Abnormal Lab Values		
Creatinine	6 (16)	4 (10)
Potassium	0 (0)	0 (0)

* rounded percentages
[a]*n* = 39, [b]*n* = 38.

Table 2

Continuous Predictor Variables (N=77)

Variable	*M*	*SD*	1	2	3	4	5	6
VAS-Diet Measure (Range 0-100)	72.16	27.32	-.014	.054	.015	-.294**	.059	.071
Predicator variable								
1. Systolic BP	132	14.74	-	.025	-.023	-.025	-.094	.203
2. Creatinine	1.16	1.04		-	.302**	-.131	.094	.354**
3. Potassium	3.98	0.45			-	.059	-.162	.075
4. PHQ-9	3.35	4.16				-	-.336**	-.075
5. LOC-Internal	4.87	0.97					-	.174
6. LOC-External	2.24	1.23						-

BP = Blood Pressure
PHQ-9 = Patient Health Questionnaire – Depression
LOC = Locus of Control
VAS-Diet = Visual Acuity Scale – Low Salt Diet

**p ≤ .01

Table 3

Multiple Regression Summary for Variables Predicting Adherence to Diet (N=77)

Variable	Model 1- Internal LOC			Model 2 - External LOC		
	B	*SE B*	*ß*	B	*SE B*	*ß*
Systolic BP	.025	0.20	0.13	-.006	0.20	-0.003
Co-morbidities	1.13	2.43	0.05	1.28	2.43	0.06
Creatinine	-4.34	3.18	-0.17	-4.92	3.29	-0.19
Potassium	24.57	7.08	0.40**	24.56	6.95	0.40**
Education	0.62	2.88	0.02	1.21	3.01	0.048
PHQ-9	-3.82	2.63	-0.17	-3.98	2.53	-.172
Support	4.51	1.68	0.31**	4.48	1.66	0.31**
LOC-Internal	0.112	.550	0.02			
LOC-External				.31	.453	0.08
R^2		0.234			0.239	
F		2.599			2.667	
p		.015			.013	

*$p < .05$; ** $p \leq .01$

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APPENDIX A: NOTIFICATION OF UMCIRB APPROVAL

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** · **www.ecu.edu/irb**

Notification of Initial Approval: Expedited

From: Biomedical IRB
To: Linda Bolin
CC:
        Patricia Crane
        Linda Bolin
Date: 7/26/2016
Re: UMCIRB 16-001183
        Self-Management in AA with HTN

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 7/26/2016 to 7/25/2017. The research study is eligible for review under expedited category # 5,7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
DEMOGRAPHIC HEALTH TOOL.docx	Surveys and Questionnaires
Dr. Powell approval letter.docx	Dataset Use Approval/Permission
HTN-SM script _MP 2016.doc	Recruitment Documents/Scripts
HTN-SM-InformedConset.doc	Consent Forms
MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL FORM.docx	Surveys and Questionnaires
PHQ-9 DEPRESSION TOOL.docx	Surveys and Questionnaires
PHYSIOLOGICAL DATA COLLECTION TOOL.docx	Data Collection Sheet

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418
IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418

APPENDIX B: LETTER OF APPROVAL FROM DR. POWELL

From: Bolin, Linda

Sent: Saturday, February 20, 2016 5:54 PM

To: Powell, James

Cc: Bolin, Linda

Subject: Linda Bolin PhD Study Request

Dr. Powell,

This is in follow-up to our early conversations about my proposed research study. As you know, I am currently a PhD student here at ECU in the College of Nursing. My proposed study is "Factors Associated with Self-Management Behavior in African Americans with Hypertension." I am particularly interested in our rural eastern North Carolina population.

I am requesting permission from you, as the Principal Investigator for the Systolic Blood Pressure Intervention Trial (SPRINT), to allow me to inform the African American participants in the SPRINT study either through a flyer or through the Study RN Nurse Coordinator, Ms. Mary Pinion, explaining my proposed study to seek out interest. I will be submitting my study to the IRB soon and would like to have your support in my study.

I look forward to hear from you and I appreciate your prompt response. Thank you.

Linda P. Bolin, PhD(c), MSN, RN, ANP

_____

I approve.

James R. Powell, MD

APPENDIX C: DEMOGRAPHIC HEALTH TOOL

1) Age on last birthday: _____

2) Gender

    0. Female

    1. Male

3) Education

    1. Less than 12th grade

    2. High School Graduate/GED

    3. Some College

    4. Graduated from College

    5. Some Graduate School

    6. Completed Graduate School

4) Marital Status

    0. Single (never married)

    1. Married

    2. Divorced/Separated

    3. Widowed

    4. Co-habitate (live with a partner)

5) Arm of the SPRINT Study

    0. Intensive

    1. Standard

6) Medication adherence score on SPRINT intake form: _____

7) Most recent PHQ-9 Score from SPRINT visit: _____

8) Who would you identify as the person who gives you the most support?

_____

9) Do you feel that the support you get from this person helps you with taking your medicine as directed?

    0.   None of the time

    1.   A little of the time

    2.   Some of the time

    3.   A good bit of the time

    4.   Most of the time

    5.   All of the time

10) Do you feel that the support you get from this person helps you with getting daily physical activity?

    0.   None of the time

    1.   A little of the time

    2.   Some of the time

    3.   A good bit of the time

    4.   Most of the time

    5.   All of the time

11) Do you feel that the support you get from this person helps you with following a low salt diet?

    0.   None of the time

    1.   A little of the time

    2.   Some of the time

    3.   A good bit of the time

    4.   Most of the time

    5.   All of the time

12) How would you rate yourself in taking your medications as prescribed by your provider (over the past month)?

|_____|
None of the time   All of the time

13) How would you rate yourself about being physically active (4+ times/week for 30+ minutes) over the past month?

|_____|
None of the time   All of the time

14) How would you rate yourself about following a low salt diet over the past month?

|_____|
None of the time   All of the time

APPENDIX D: PHYSIOLOGICAL DATA COLLECTION TOOL

1. Date of most recent BP reading: _____

    ▪ Systolic BP reading: _____

    ▪ Diastolic BP reading: _____

2. BMI: _____

    ▪ Height: _____

    ▪ Weight: _____

3. Total Number of Co-Morbidities: Score: _____ (range 1-5)

1	0	Co-morbidity
Yes	No	
		Cardiovascular Disease other than Stroke (e.g. CHF, PVD)
		Chronic Respiratory Disease (e.g. asthma, COPD)
		Chronic Kidney Disease (eGFR 20-59 ml/min/1.73m2)
		Diabetes after enrollment into SPRINT
		Arthritis

4. Laboratory (SPRINT normal range)

1	0	Laboratory	Laboratory Value
abnormal	normal	(Normal Range)	
		Creatinine (0.6-1.5 mg/dl)	
		Potassium (3.0-5.5 mEq/L)	

APPENDIX E: MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL FORM - C

Instructions: Each item below is a belief statement about your medical condition with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item we would like you to circle the number that represents the extent to which you agree or disagree with that statement. The more you agree with a statement, the higher will be the number you circle. The more you disagree with a statement; the lower will be the number you circle. Please make sure that you answer **EVERY ITEM** and that you circle **ONLY ONE** number per item. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

1=STRONGLY DISAGREE (SD)	4=SLIGHTLY AGREE (A)
2=MODERATELY DISAGREE (MD)	5=MODERATELY AGREE (MA)
3=SLIGHTLY DISAGREE (D)	6=STRONGLY AGREE (SA)

		SD	MD	D	A	MA	SA
1	If my hypertension worsens, it is my own behavior which determines how soon I will feel better again.	1	2	3	4	5	6
2	As to my hypertension, what will be will be.	1	2	3	4	5	6
3	If I see my doctor regularly, I am less likely to have problems with my hypertension.	1	2	3	4	5	6
4	Most things that affect my hypertension happen to me by chance.	1	2	3	4	5	6
5	Whenever my hypertension worsens, I should consult a medically trained professional.	1	2	3	4	5	6
6	I am directly responsible for my hypertension getting better or worse.	1	2	3	4	5	6
7	Other people play a big role in whether my hypertension improves, stays the same, or gets worse.	1	2	3	4	5	6
8	Whatever goes wrong with my hypertension is my own fault.	1	2	3	4	5	6
9	Luck plays a big part in determining how my hypertension improves.	1	2	3	4	5	6
10	In order for my hypertension to improve, it is up to other people to see that the right things happen.	1	2	3	4	5	6
11	Whatever improvement occurs with my hypertension is largely a matter of good fortune.	1	2	3	4	5	6
12	The main thing which affects my hypertension is what I myself do.	1	2	3	4	5	6
13	I deserve the credit when my hypertension improves and the blame when it gets worse.	1	2	3	4	5	6
14	Following doctor's orders to the letter is the best way to keep my hypertension from getting any worse.	1	2	3	4	5	6

15	If my hypertension worsens, it's a matter of fate.	1	2	3	4	5	6
16	If I am lucky, my hypertension will get better.	1	2	3	4	5	6
17	If my hypertension takes a turn for the worse, it is because I have not been taking proper care of myself.	1	2	3	4	5	6
18	The type of help I receive from other people determines how soon my hypertension improves.	1	2	3	4	5	6

APPENDIX F: PATIENT HEALTH QUESTIONNAIRE

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME:_____ DATE:_____

Over the last 2 weeks, how often have you been bothered by any of the following problems? *(use "✓" to indicate your answer)*	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3

add columns   +   +

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card).   TOTAL:_____

10. If you checked off *any problems*, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?	
	Not difficult at all _____
	Somewhat difficult _____
	Very difficult _____
	Extremely difficult _____

APPENDIX G: SCRIPT

Hello Ms./Mr. _____. My name is Mary Pinion and as you know, I have been working with the SPRINT study at East Carolina University. I am (calling you/talking to you) because you are/were enrolled in the SPRINT study.

We have another important project that is being conducted with African American women and men who have high blood pressure, such as you. The nurse researcher, Linda Bolin, involved with this study wants to know about your self-management behaviors. Your input will be added to other African American men and women's input to see how you manage your blood pressure.

I am asking permission to either give you the information to call Linda Bolin yourself and find out more about this study OR permission to provide your name and telephone number to Linda Bolin, the nurse researcher. If you give permission, this does not require you to answer any questions but just to hear more about the study.

If you choose to participate, this study will only take about 1-2 hours of your time on just one day. The nurse researcher, Linda Bolin, will meet you in the SPRINT clinic. She will ask you general questions about yourself (such as if you are married, how many medications you are taking) and will ask you to complete a few questionnaires like the ones you did for the SPRINT study. You will receive a $20 gift card to thank you for your time.

Would you like to hear more about this study?   Yes_____ No_____
If Yes: Would you like to:

      ☐ Contact Linda Bolin, the research nurse, yourself?
         (Contact telephone number for Linda Bolin is 252-258-0176)

      ☐ Have Linda Bolin contact you?
         If you prefer Ms. Bolin to contact you, please provide a telephone
         number where she can reach you: _____