SELF-BLOOD PRESSURE MONITORING, STAGE OF CHANGE, MEDICATION ADHERENCE, SELF-EFFICACY AND BLOOD PRESSURE CONTROL IN HYPERTENSIVE WORKERS

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ABSTRACT

According to the World Health Organization, hypertension is the leading cause of death in the world and it is one of the primary reasons patients seek health care. Prior to 2010, uncontrolled blood pressure (BP) rates were approximately 18%, despite the fact that prescribed medical treatment is available to adequately control patients’ BP. It has been established that medication adherence is a major factor in controlling BP, and self-BP monitoring is highly recommended by the national guideline to improve blood pressure control. However, information related to assessing hypertensive patients’ readiness to engage in health care treatment and self-monitoring is limited in the literature. In addition, there is a gap in the literature regarding self-efficacy for medication adherence and BP control among those patients with access to health care, such as municipal workers.

The purpose of the study was to examine the relationships among stage of change, medication adherence, and medication adherence self-efficacy, and to determine the best predictors for the odds of BP control and self-blood pressure monitoring in hypertensive municipal workers. The Transtheoretical Model (TTM), highly acclaimed in the field of health behavior, guided this investigation. A convenience sample of 149 hypertensive workers completed self-administered questionnaires including the Stage of Change Questionnaire, Medication Adherence Self-Efficacy Scale, Morisky Medication
Adherence Scale, and a Behavioral Risk Factor Surveillance System (BRFSS) based questionnaire. Descriptive statistics, correlations, and multiple logistic regression models were used for data analyses. The participants were primarily well educated, middle aged ($M=47$, $SD=8.4$), African American, male municipal employees in the public safety department of a large southeastern US city. More than three-quarters of the participants had controlled blood pressure (75.70%) and a high proportion (70%) reported self-blood pressure monitoring. Stage of change was a significant independent predictor of self-blood pressure monitoring. Further, there was a significant correlation between stage of change and medication adherence and stage of change and medication adherence self-efficacy. Age was positively associated with medication adherence self-efficacy and with medication adherence. This study may inform development of stage-correlated interventions to achieve improved BP control in hypertensive workers.
DEDICATION

To my Lord and Savior Jesus Christ, the author of my faith, you are the reason for my success. To my soul mate Mr. Bythel Shropshire for all of his love, emotional support, and joy: “Where would I be without you? Where would I go to let it all out?” You have taught me how to enjoy this journey. I would like to express my deepest gratitude to my most valuable asset and to whom I am the most proud, my beautiful daughters, Angele Trenese Shropshire and Toneyell Sherell Shropshire. You are the “best and the brightest.” I want to truly thank both of you for all of the life lessons you have taught me over the years and for inspiring me to pursue this goal. I love you so much! I want to especially thank my mom, Mrs. Shirley Mae Breaux, dad, Mr. Joseph Breaux, and my grandmother, Mrs. Mary Louise McNeal who all provided me with much love, influence and advice throughout the years. Mom, you have bestowed upon me your love for lifelong learning and have always encouraged me to strive wholeheartedly to make a contribution to help make the world a better place to live. Momme, you have taught me how to find the peace that surpasses all understanding. Thanks you all so much! Without all of your emotional support and presence, I may not have accomplished this goal.

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lost the battle with colon cancer on March 7, 1994. I noted that self-monitoring your blood pressure at home motivated you to adopt a healthier life style. You were my very first case study. In memory of my great-grandfather, Mr. Charlie Foster, who had type II diabetes for more than 60 years and passed at the age of 97 of natural causes. I did not know it at the time but you gave me my very first research question. Both of my grandfathers have influenced my belief in self-monitoring of health risk factors. To my youngest brother, Mr. Sean Breaux, who I lost on June 24, 2009, and who was looking forward to seeing me reach this milestone. Sean, I made it! Thank you all so much! I also wish to thank all of my dear friends, especially those in my research team for all their work, love and best wishes. Thanks so much! I would like to also thank church members, Mr. Ivory Flemings and Mr. Jesse Green for all the Time magazines and newspapers in my early life.
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CHAPTER 1

INTRODUCTION

Cardiovascular disease (CVD) is the number one killer in the United States (Center for Disease Control, n.d.). Uncontrolled hypertension is an independent risk factor for stroke, end stage renal disease, and cardiovascular morbidity and mortality (Chobanian et al., 2003). Although hypertension can be adequately controlled with appropriate blood pressure (BP) medications, the prevalence of uncontrolled BP among those with hypertension in the U.S. population has been reported to be as high as 70 percent (American Heart Association, 2009; Denny, Greenland, Ayala, Keenan, & Croft, 2007). Full-time employed adults, who usually have available resources such as insurance, and access to healthcare may still have rates of uncontrolled hypertension that are unacceptable.

Among the Healthy People 2010 priorities are the goals to decrease hypertension mortality by 20%, decrease workers’ risks of cardiovascular disease, and lower healthcare costs (U. S. Department of Health and Human Services, n.d.). Medication adherence can prevent complications of hypertension, such as stroke, kidney disease, and cardiovascular morbidity and mortality. The estimated cost of these preventable complications has been billions of dollars a year (U.S. Department of Health and Human Services, 2004). Other Healthy People 2010 priorities are the goals of increasing the percentage of adults with hypertension who are taking action to control their BP from
82% to 95% and increasing hypertension control in adults from 18% to 50%. Therefore, BP control remains an important issue for public health.

Statement of the Problem

In the United States, hypertension affects one in four adults (American Heart Association, 2003), and 90-95% of patients have essential hypertension, which is defined as hypertension from unknown causes (American Heart Association, 2007; Chobanian et al., 2003). Despite the availability of effective medications, the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC 7) treatment guidelines, and increased awareness, hypertension remains inadequately managed in the United States (Chobanian et al., 2003) and other countries (Whelton, He, & Muntner, 2004).

The condition of uncontrolled hypertension is defined as a systolic BP (SBP) greater than 140 mm Hg or a diastolic BP (DBP) greater than 90 mm Hg. For patients with diabetes and kidney disease, hypertension is defined as a systolic BP greater than 130 mm Hg or a diastolic BP greater than 80 mm Hg (Chobanian et al., 2003). Uncontrolled BP is a major risk factor for cardiovascular disease and stroke (Chobanian et al., 2003).

According to the JNC 7 (2003), individuals are likely to have poor control of their BP if they lack motivation to take their medication and if their physicians are not aggressive in their hypertension treatment. Krousel-Wood, Hyer, Muntner, and Morisky (2005) identified two factors that make it problematic for hypertensive patients to adhere to their treatment regimens. First, hypertension is a silent disease that often has no associated symptoms; therefore, patients with hypertension may not perceive themselves
as sick and therefore may find medication adherence difficult. Second, hypertension is a chronic disease that usually requires long-term use of medication. These two factors combined may be associated with hypertensive patients’ not being motivated or not feeling confident to continue a routine hypertensive regimen for the rest of their lives.

Hypertension is easily detected and can be effectively controlled with adherence to the appropriate treatment. Several questions remain unanswered about the high prevalence of uncontrolled hypertension in the United States and other countries. Although many factors contribute to poor BP control, non-adherence to BP medication has been found to be a key factor in BP management (Bosworth et al., 2008; Bramley, Gerbino, Nightengale, & Frech-Tamas, 2006; Krousel-Wood, Hyre, Muntner, & Morisky, 2005). Results of clinical trials have indicated that target BP control, as recommended by the JNC 7, can be obtained with medication adherence (Chobanian et al., 2003; Hynes & Sackett, 1976).

Non-adherence to BP medication is defined as not taking antihypertensive medications as prescribed, which includes skipping medications (intentionally or non-intentionally) (Johnson, Driskell, Johnson, Prochaska et al., 2006). Because adherence to antihypertensive medication is important for controlling hypertension, further study is needed to understand the influence of medication adherence on blood pressure control in a working population who has access to health care, insurance coverage for prescription medication, and awareness of the health risks. Some city workers such as first responders (police officers, firefighters, paramedics) have a high prevalence of hypertension and often their BP is uncontrolled (Kales, Tsismenakis, Zhang, & Soteriades, 2009). Recent research findings have suggested that non-adherence to medication is a major reason for
uncontrolled hypertension in this group; however, additional research is warranted among first responders and other occupational groups.

Perceived self-efficacy is a construct from social cognitive theory based on the work of Bandura (1982, 1986). According to Bandura (1986), cognitions can determine actions and help explain human behavior. Self-efficacy, ones’ belief in the ability to perform an action, is behavior, situation, and population specific. Self-efficacy has been established as the most prominent predictor of health-related behavioral change (Bandura, 1986; Brus, van de Laar, Taal, Raker, & Wiegmann, 1999). Many studies have focused on self-efficacy with a variety of health-related behaviors (Sallis, Pinski, Grossman, Patterson, & Nader, 1988; Walcott-McQuigg & Prochaska, 2001), but few published studies have focused on this psychosocial variable as applied to medication adherence.

Some study findings have suggested that individuals lack readiness (Prochaska, DiClemente, & Norcross, 1992) or motivation (Chobanian et al., 2003; Johnson, Driskell, Johnson, Prochaska et al., 2006) to adhere to their antihypertensive medications to control their BPs. Obtaining sufficient BP control often requires a behavioral change (Lenz & Shortridge-Baggett, 2002). A behavioral change usually occurs gradually over a continuum of stages (Prochaska & DiClemente, 1983), and evidence has suggested that it does not occur until the “pros” of changing (i.e., medication adherence) significantly outnumber the “cons.” The Transtheoretical Model of Change provides a framework to describe these stages of change (Prochaska et al., 1992).
For many years, office BP (OBP) readings have been the standard for diagnosing and managing hypertension, despite evidence that this method is limited (Pickering, 2008). High readings taken in the physician’s office do not usually constitute a medical emergency and repeated measurements on more than one occasion are needed to obtain an accurate diagnosis. Frequent BP monitoring away from the physician’s office can be used to confirm a diagnosis or to monitor a person’s response to treatment and measurement can be taken with an inexpensive semi-automatic device or an expensive ambulatory BP device (Chobanian et al., 2003).

Findings from evidenced-based medicine led to the recommendation of home BP monitoring use as a supplement to usual care in the guidelines developed by JNC 7 and the European Society of Hypertension-European Society of Cardiology (ESH-ESC) (American College of Physicians, 1993; Chobanian et al., 2003; Fahey, Schroeder, & Ebrahim, 2007). According to previous research, home BP monitoring is a more accurate measurement of systolic and diastolic BP than office BP monitoring, and predicts cardiovascular morbidity and mortality (Baguet & Mallion, 2002; Yarows, Julius, & Pickering, 2000). Although blood pressure management has been found to be positively influenced by this additional self-BP monitoring at home, physicians do not routinely recommend self-BP monitoring. Nevertheless, monitoring BP outside of physicians’ offices is increasing among persons with hypertension.

Facilitating patients’ independence in disease management may be necessary for adequate BP control (Lenz & Shortridge-Baggett, 2002). The aim of this study is to examine whether there is an association between stages of change, medication adherence, medication adherence self-efficacy, self-monitoring of blood pressure and the odds of blood pressure control in a sample of municipal public safety workers. This study may inform development of tailored stage-based interventions that may increase medication
adherence and self-monitoring of blood pressure to achieve improved hypertension control in a working population.

Purposes of the Study

The purposes of this study were to: (1) identify the best subset of predictors of blood pressure control in workers with hypertension from a set of personal factors (age, gender, race, and marital status), stage of change, medication adherence, medication adherence self-efficacy; (2) test whether adding frequency of home blood pressure monitoring to the model increases its predictive ability; and (3) identify the best predictive model for home blood pressure monitoring in workers with hypertension from a set of personal factors (age, gender, race, and marital status), stage of change, medication adherence, and medication adherence self-efficacy.

Research Questions

This study examined the following research questions:

1) What is the prevalence of self-blood pressure monitoring, blood pressure control, and medication adherence in workers with hypertension?

2) a. Is there a difference in medication adherence by stage of change (pre-contemplation, contemplation, preparation, action, and maintenance)?

   b. Is there a difference in medication adherence self-efficacy by stage of change?

3) What is the bivariate relationship between medication adherence and medication adherence self-efficacy?

4) a. Is there a relationship between stage of change and blood pressure control?

   b. Is there a relationship between stage of change and self-blood pressure monitoring?
5) a. Is there a relationship between medication adherence self-efficacy and blood pressure control?
   b. Is there a relationship between medication adherence self-efficacy and self-blood pressure monitoring?

6) What is the best predictive model for blood pressure control in workers with hypertension using stage of change, medication adherence self-efficacy, medication adherence and personal factors (age, gender, race, education and marital status)?

7) Does the inclusion of self-blood pressure monitoring improve the predictive ability of the above model?

8) What is the best predictive model for self-blood pressure monitoring using stage of change, medication adherence self-efficacy, medication adherence, and personal factors (age, gender, race, education, and marital status)?

Theoretical Framework

Several theoretical frameworks have been used to guide studies focused on BP control. Social Cognitive Theory (SCT), developed by Bandura (1986), states that individuals agree to adhere to a behavior, such as medication adherence, when they believe that the behavior will benefit them in a great way and is unlikely to harm them (Bandura, 1986). Self-efficacy, a key construct of the SCT, contributes to motivating the individual to perform the health behavior by creating a desire for and a willingness toward adopting the behavior, and setting the goal that is expected. Lower levels of self-efficacy have been associated with elevated BP (Williams, Connor, & Ricciardelli, 1998). The SCT lacks an important variable that may predict health behavior: level of
motivation, or stage of change. Therefore, the Transtheoretical Model of Change was also selected to guide the proposed study.

*The Transtheoretical Model of Change (TMC)*

Prochaska and DiClemente (1983:1984) developed the Transtheoretical Model of Change (TMC). The TMC is a model of intentional change which focuses on decision making (Johnson, Driskell, Johnson, Prochaska et al., 2006). The model includes four major constructs: the stage of change, processes of behavior change, decisional balance, and self-efficacy. This model can guide the health care provider’s understanding of the motivation of individuals who are being treated with medications to control their BPs. Effective interventions could be developed for each stage based on the TMC and evaluated to move individuals to the maintenance stage. The interventions could also address relapses that may occur once a person takes action.

The model was developed initially for use in studies involving psychotherapy and addiction, but has been successfully applied to a broad range of health behaviors in numerous studies (Prochaska, Velicer et al., 1994). Prochaska and DiClemente’s (1983) first study of self-change was a retrospective analysis of the processes used by smokers who successfully stopped smoking on their own compared to the processes used by those who participated in treatment programs. Both the self-changes and the therapy-changers responded that their use of the processes depended on which stage they were in during the course of change. The study participants further differentiated four common stages of change that they experienced during smoking cessation: contemplation, decision, action,
and maintenance. Prochaska and DiClemente concluded that behavior change was a process and not a specific event.

Within the last ten years, the TMC has been used in studies of medication adherence with other health-related behaviors (Johnson, Driskell, Johnson, Dyment et al., 2006; Johnson, Grimley, & Prochaska, 1998). Only a few studies have utilized the TMC in research concerning BP medication adherence (Johnson, Driskell, Johnson, Prochaska, et al., 2006). Two constructs from the TMC, stage of change and perceived self-efficacy, were selected for this study of blood pressure control because of the view that timing the intervention with readiness to adhere to antihypertensive medication is important in long-term treatment regimens (Krousel-Wood et al., 2005; Sidani & Braden, 1998).

Stage of Change

A person’s current stage of change is a reflection of personal level of motivation to change an undesired behavior or to acquire a healthy and desired behavior (Prochaska et al., 1992). Thus, the TMC is useful because identification of a person’s stage allows for the tailoring of interventions that match where the person may be in the process of change, potentially leading to optimal results (Grimley et al., 1994; Prochaska, Velicer et al. 1994;). For the purposes of this study, the health behaviors in this investigation involve individuals’ adherence to their BP medications and self-monitoring to control their BP.

The TMC approaches behavior change as a dynamic process, and research findings have suggested that individuals attempting to change their behavior move through a continuum of five stages: (a) pre-contemplation (not thinking about change),
(b) contemplation (thinking about changing but have not started), (c) preparation (seriously thinking about changing soon and has taken some steps toward action; trying out the behavior but not in a consistent way), (d) action (performing the behavior consistently for less than 6 months), and (e) maintenance or sustaining the behavior over time [i.e., more than 6 months] (Prochaska & DiClemente, 1983). The TMC is based on the premise that individuals progress through these specific stages of change towards action and the adoption of healthy behaviors, such as adherence to their BP control and self-BP monitoring. Data are available to support that 20% of persons are in the preparation stage and ready for action-oriented programs. The majority of individuals cannot benefit from many of the resources that are offered because they are not ready to receive them. Financial resources are wasted on a large percentage of interventions due to lack of enrollment or high attrition rates; therefore, their effectiveness cannot be accurately measured.

**Self-Efficacy**

According to Prochaska et al. (1983) and Bandura (1982), self-efficacy is an individuals’ perceived confidence that the desired behavior can be performed in a given situation. Self-efficacy determines whether or not knowledge and skills are actually used to successfully perform the desired behavior. Therefore, this construct may be a key factor in self-management behaviors (Chang, McAlister, Taylor, & Chan, 2003), which may be necessary for controlling BP. The TMC postulates that as a person progresses through the stages of change, self-efficacy increases and the threat of relapse decreases (Prochaska & DiClemente, 1983). Self-efficacy can be used to explain adherence
behavior in hypertensive patients and can be assessed over time to determine the efficacy of an intervention efficacy (Ogedegbe, Mancuso, Allegrane, & Charlson, 2003). The relationship between the stages of change and self-efficacy is shown in figure 1.
TRANSTHEORETICAL MODEL OF CHANGE (TMC)

Stage of Change

and

Self-Efficacy

Figure 1. Conceptual framework
Definition of Terms

The definitions for the study are the following:

*Self-blood pressure monitoring* refers to the individual’s report of use of a blood pressure device to measure personal blood pressure outside the physician’s office (home, pharmacy, or in the community). A self-administered modified Behavior Risk Factor Surveillance System (BRFSS) questionnaire was utilized to obtain this information (Centers for Disease Control, 2008).

*Stage of change* refers to an individual’s readiness to maintain adherence to blood pressure medication at least 80% of the time and was measured by the Stage of Change Questionnaire (Prochaska, Norcross, & DiClemente, 1994).

*Medication adherence* refers to the individual’s self-report of compliance with taking blood pressure medication at least 80% of the time and was measured by the Morisky Medication Adherence Scale (MMAS; Morisky, Green, & Levine, 1986).

*Medication self-efficacy* refers to an individual’s confidence in being able to adhere to a medication regime was measured by the revised Medication Adherence Self-Efficacy Scale MASES-R (Fernander, Chaplin, Schoenthaler, Ogedegbe, 2008; Ogedegbe et al., 2003).

*Personal factors* refer to the individual’s self-reported age, gender, race, education, and marital status as measured by the Good Health Program Questionnaire.

*Blood pressure control* is defined according to the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood
Pressure (JNC 7) guidelines as blood pressure less than 140/90 mm Hg (Chobanian et al., 2003). The lower of two blood pressures measurements taken three minutes apart with an automatic device after five minutes of rest was recorded as the BP score.

*Hypertensive workers* refer to municipal workers above the age of 19 who attended the Good Health Program screen and who have been told that they have hypertension.

The Good Health Program (GHP) is a work wellness program provided to the city workers of Birmingham, Alabama. The history of the program is explained elsewhere (Brown, Hilyer, Artz, Glasscock, & Weaver, 1995; Forrester, Weaver, Brown, Phillips, & Hilyer, 1996; Weaver  1998, Sinsuesatkul, 2006). The aim of this work site wellness program is to promote and protect the health of workers to prevent and reduce risk factors for cardiovascular illnesses and diseases, potentially decreasing health care cost. The program was originally funded by the National Heart, Lung, and Blood Institute (NHLBI). Routine screenings and intervention are completed by the GHP staff which includes a dietician, exercise physiologist and occupational health nurse practitioners.

The City of Birmingham consists of 22 departments including fire, city council, finance, public safety, traffic engineering, municipal court, library, community development and equipment management department among others (Good Health Program, n.d.). The participants for this study were recruited at the Fall health screen, which included public safety workers (police officers and firefighters), as well as employees from other departments.
Study Assumptions

For the purpose of this study, assumptions were as follows:

1) Blood pressure control is a complex phenomenon that consists of physiologic, behavioral, and psychosocial factors.

2) Individuals with hypertension can accurately report their health behaviors and perceptions of psychological factors.

3) Individuals have a desire to maintain health.

4) Health behavior change is a dynamic process.

5) Individuals with hypertension are in various stages of change or readiness to perform health behaviors related to managing their condition.
CHAPTER 2
LITERATURE REVIEW

Several clinical trials have demonstrated that BP medications are effective in reducing BP to target goals when individuals take their medications as prescribed. However, many research findings suggest that the problem of poor medication adherence is complex, and not much is known about the mechanism of self-BP monitoring on BP control. In addition, the best factors to influence blood pressure control and the use of self-BP monitoring are unknown. Literature was reviewed relevant to the major variables in this study, including blood pressure control, stage of change, medication adherence, medication adherence self-efficacy, and self-BP monitoring.

Hypertension and the Risk of Cardiovascular Events

Government agencies (Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; European Society of Hypertension-European Society of Cardiology) and professional societies (American College of Cardiology, American Heart Association) agree that high blood pressure is a major independent risk factor for cardiovascular disease. Other major risk factors for cardiovascular disease include smoking, high blood cholesterol, diabetes, male gender and older age. Controlling individuals’ BP at the target goals recommended by JNC 7 and the World Health Organization-International Society of Hypertension (WHO-ISH) prevents target organ damage and reduces cardiovascular morbidity and mortality.
Several epidemiologic study findings have established that uncontrolled blood pressure has a significant positive relationship with cardiovascular disease events (Kannel, 1996; MacMahon et al., 1990; Stamler, Stamler, & Neaton, 1993).

As early as 1948, the Framingham Heart Study was conducted to determine which factors predict cardiovascular disease in men and women ages 30-62. The Framingham study, a large observational longitudinal epidemiological study, recruited over 5000 volunteers in a representative sample of individuals without cardiovascular disease and several trends were noted over time. As a result of this large prospective study the concept of “risk factors” for cardiovascular disease was derived. The findings from the Framingham study suggested that high BP is a risk factor for cardiovascular disease and stroke. Since then, many randomized clinical trials have supported these findings.

Evidence exists that reducing BP levels (SBP and/or DBP) will decrease the risk of cardiovascular morbidity and mortality in men and women with high BP, regardless of race, gender, and age (Vasan et al., 2001). The Veterans Administration Cooperative Study Group (1967) conducted a study as a follow-up to the very first randomized controlled trial of medication treatment for severe uncomplicated hypertension by Hamilton, Thompson and Wisniewski in 1964 (cited in Beevers, 2004). The Veterans Administration Cooperative Group study was a randomized clinical trial that included 143 men with DBP between 115 and 129 mmHg. The findings revealed that antihypertensive medication was effective in reducing BP and cardiovascular events (Beevers).
Another Veteran Administration trial was conducted in 1970 on a sample of 280 men, with 186 receiving drug treatment and 94 in the control group (Veterans Administration Cooperative Study Group on Antihypertensive Agents, 1970). Findings from this study demonstrated a significant benefit from BP medication treatment in that there were only 9 events and 8 deaths in the drug treatment group as compared to 35 events and 16 deaths in the control group. The majority of the benefit was seen in preventing stroke and congestive heart failure and less benefit was noted for heart attack, particularly in individuals with DBP greater than 105 mmHg.

The Multiple Risk Factor Intervention Trial (MRFIT) was a longitudinal study (1973-1996) of 342,815 men conducted to determine the relationship between uncontrolled BP and cardiovascular mortality in men between ages 45-57. The MRFIT study demonstrated that for every 20 mm Hg elevation of SBP or 10 mm Hg in DBP there was a twofold increase in mortality from stroke and coronary heart disease (Domanski et al., 2002).

Kannel and colleagues (1986) used the MRFIT data to determine the effects of risk factors on cardiovascular disease and all cause mortality rates in white men between the ages of 35-57. There were 6,968 deaths and 2,426 incidents of cardiovascular disease during the six year period. Serum cholesterol, diastolic BP, and cigarette smoking were the variables examined. The results suggested that there was an increase in risk when the effects of these variables were combined. Age reduced the strength of the relationships. Without the risk factors of serum cholesterol, DBP, and cigarette smoking, cardiovascular mortality decreased by two-thirds for men between the ages of 35-45 and by 50% for 46-57 year olds. The findings also revealed that heart attacks were twice as common in
individuals with a DBP greater than 90 mm Hg than in individuals with DBP less than 90 mm Hg (Kannel et al., 1986).

In addition, the MRFIT study revealed that SBP appeared to be more significant than DBP and pulse pressure, the difference between the averaged SBP and DBP, in men 35-44 years of age (Domanski et al., 2002). The MRFIT study findings were supported by many other studies including a meta-analysis of 61 prospective observational studies (Prospective Studies Collaboration, 2002). Although the MRFIT study was a large prospective randomized trial, it failed to include African American men.

The Prospective Studies Collaboration (2002) was a meta-analysis study that examined 61 prospective studies to determine the impact of risk factors, particularly blood pressure and cholesterol, on cardiovascular disease. Studies conducted in Europe, North America, Australia, Israel, China, and Japan that contained BP and blood cholesterol at baseline were included in the meta-analysis. The Framingham and MRFIT studies were among the studies analyzed. Participants were followed up to determine the reasons for their deaths. The findings suggested an age specific importance for blood pressure in predicting cardiovascular deaths. Total blood cholesterol was related to heart attacks in individuals 50 years old and older, but total blood cholesterol was not an independent risk factor for stroke deaths. Studies in the Prospective Studies Collaboration excluded the co-morbidity of diabetes, and blood pressure measurements were subjected to inter-rater bias because the readings were obtained using a mercury sphygmomanometer. The use of this instrument produces a biased result if the health care provider taking the measurement favors terminal digits, which is rounding blood pressure measurements to the nearest zero (Handler, 2009).
The benefits of avoiding cardiovascular events and decreasing health care costs have been demonstrated by many large prospective randomized control trials (SHEP Cooperative Research Group, 1991; The ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group, 2002; Vasan et al., 2001). Controlling BP has a larger impact on stroke than on heart disease. A 5-6 mm Hg reduction in DBP is related to a 35%-40% decrease in strokes, but only a 20%-25% reduced incidence of coronary heart disease (Chobanian et al., 2003). Ischemic heart disease is the most common type of heart disease related to high blood pressure (Lloyd-Jones, 2008).

Risk factors such as age, gender, race and family history cannot be modified, and behavioral modifiable risks factors (e.g., diet, exercise, smoking, and alcohol) appear to be more difficult to change than simply reducing BP with medications. Incorporating lifestyle modification should always be encouraged with or without medication treatment. However, focusing on the physiologic risk factors, such as using medication to reduce the BP of an individual with uncontrolled BP, can be an effective intervention to decrease cardiovascular morbidity and mortality if the individual adheres to the medication regimen. Yet, few studies in recent years have examined behavioral and psychological influences on blood pressure control.

BP Awareness, Treatment and Control

Over three decades, many randomized controlled intervention trials have been conducted which have demonstrated that BP medications are effective in reducing BP and cardiovascular morbidity and mortality. Studies that focused on the benefits of antihypertensive medication have demonstrated that a 10-12 mm Hg reduction in SBP or
a 5-6 mm Hg reduction in DBP would decrease coronary heart disease by 14-18% and stroke by 35-40% (Chobanian et al., 2003). The available evidence has demonstrated that awareness, treatment and control of hypertension are well below the national goal of 50% despite improvement over the years.

Initially, hypertension research was focused on the treatment of severe hypertension because the antihypertensive drugs had severe side effects. At that time, many physicians were reluctant to start their patients on the antihypertensive medications due to the risk of serious side effects. Studies conducted as early as the 1960’s had methodological limitations, and many failed to include participants who were African American, a group found to have high rates of hypertension.

Another limitation in early research was the short duration of some drug trials. For example, the Australian National Blood Pressure Study (1980) was a randomized clinical trial conducted to determine the benefit of an antihypertensive on BP control. Chlorothiazide, a diuretic, was tested in 3427 men and women with DBPs of 95-109 mmHg. Statistically significant differences were found with 31 strokes observed in the control group and 17 in the treatment group. Due to the significant benefits in prevention of strokes with use of this medication, the trial was discontinued early; thus, information on long-term outcomes was not obtained.

As a result of many randomized drug trials, a large number of drugs have been made available to date that successfully treat individuals with hypertension under many circumstances. Even individuals with hypertensive emergencies can be effectively treated. However, treatment is recommended at the level of BP that the benefit of treatment outweighs the burden and cost of non-treatment (Domanski et al., 2002).
Medication treatment is deemed beneficial when the majority of multiple readings fall within the recommended normal levels (JNC 7, 2003). The British Hypertension Society and the Joint National Committee strongly recommend a careful assessment of hypertension before treatment is started.

Once the benefit of medication treatment was established, efforts have continued over the years to determine the optimum drug class to prevent cardiovascular disease, especially heart attack. Beta-blockers and diuretics were the established standards before ACE inhibitors, calcium channel blockers and angiotensin receptor antagonists. As a result of trials involving new medications, physicians were often prescribing newer and more expensive hypertensive drugs and were avoiding the use of diuretics until the results of the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) were published (ALLHAT Collaborative Research Group, 2002).

The ALLHAT study was the largest randomized, controlled, double blind clinical trial in America to include a large proportion of African Americans. The ALLHAT study included a sample size of 42,418 high-risk hypertensive participants 55 years old and older. One of the two aims was to determine which of three types of drugs (ACE inhibitors- Lisinopril, calcium blockers- Amlodipine, and alpha blockers- Doxazosin), when compared with a diuretic (Chlorthalidone), would decrease coronary heart disease in a diverse population over eight years (Cushman et al., 2002). The Doxazosin arm was terminated early due to a high prevalence of congestive heart failure when compared to the diuretic arm (ALLHAT Collaborative Research Group, 2002).

The findings of the ALLHAT study revealed that diuretics are the first drug of choice for hypertension and that most individuals with hypertension will require a multi-
drug regimen of two or more medications. Diuretics were more effective than ACE inhibitors, calcium channel blockers or alpha-blockers in individuals without congestive heart failure or left ventricular hypertrophy in the prevention of congestive heart failure. The diuretic was found to be better than the other drugs for reducing congestive heart failure and stroke. However, the drugs were found to be equal in preventing cardiovascular events. The limitation of this study was that the researchers failed to include a combination drug arm and they did not examine the impact of diuretics on the mortality of individuals with congestive heart failure. These results were published in time to be considered in the JNC 7 (2003) guidelines, which also continue the more aggressive drug treatment recommendations of the JNC 6 (1997). The newer drugs were also recommended to begin at the threshold of blood pressures greater than 140/90 mmHg, which would include a larger amount of individuals.

Although antihypertensive medications have demonstrated to be efficacious in the treatment of hypertension, not all medications work in all patients. Therefore, individuals’ BP must be monitored closely to precisely adjust the most effective dose and medication. While maximizing the BP treatment, primary care providers try to minimize side effects.

Hypertension is more severe and prevalent in African Americans than other ethnic groups (Chobanian et al.). Diuretics are the drug of choice for African American hypertensive patients (ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group, 2002). Generally, African Americans are more susceptible to angioedema caused by ACEIs (Chobanian et al., 2003). They may need a
diuretic in combination to their antihypertensive to control their blood pressures (Chobanian et al.).

One of the aims of the national guidelines is to increase awareness of hypertension (Chobanian et al.). Due to these efforts and others, blood pressure awareness has improved between 1999 and 2008 from 68.5% to 71.8% ($p=0.04$: Kotchen, 2010). According to the National Health and Nutrition Examination Survey, better blood pressure control denotes improvement in the awareness and treatment of blood pressure (Egan, Zhao, & Axon, 2010).

Stage of Change

Treatment is challenging for individuals diagnosed with hypertension because this chronic disease is usually without symptoms. Because they do not feel ill, individuals may experience denial when told they have hypertension and the denial results in failure to be ready for instructions and treatment. An assessment of an individual’s stage of change is beneficial to establish an optimal care plan for each individual. Douglas et al. (2003) recommended an individualized care plan as an essential element in successfully reducing BP. The specific care plan should be based on each individual’s level of readiness to appropriately address the cons to move the individual to the action or maintenance stages.

Obtaining sufficient BP control often requires a behavioral change (Lenz & Shortridge-Baggett, 2002), which usually occurs gradually over stages (Prochaska & DiClemente, 1983). The TMC suggests that change does not occur until the pros of the
desired behavior, such as medication adherence, outweigh the cons of that behavior (Prochaska et al., 1992).

Few researchers have used the TMC to guide their research focusing on medication adherence in patients with hypertension (Johnson, Driskell, Johnson, Prochaska et al., 2006). In fact, only one study was found that used the TMC to examine medication adherence in hypertensive patients (Johnson, Driskell, Johnson, Prochaska et al., 2006). These researchers’ randomly assigned participants to three six-month TMC based interventions and usual care, and surveyed the participants at 6, 12, and 18 months. A significantly higher number of participants who received the intervention were in the action or maintenance stage than participants receiving usual care. Their findings suggested that the TMC interventions were useful for improving medication adherence in this population.

Two additional studies utilized the TMC to examine medication adherence with other health conditions. One study examined whether the TMC would predict birth control medication adherence (Johnson, Grimley, & Prochaska, 1998). Findings demonstrated that demographic and sexual history did not predict adherence to birth control pills in 306 medication users. The authors noted that they failed to include participants that had discontinued pill use among the pill users, which may have affected the results because pill users who had discontinued use would have been more easily detectable. The most extreme form of non-adherence is the discontinued user (Johnson, et al., 1998).

The second study with a sample of 404 adults evaluated the efficacy of a TMC based intervention to improve cholesterol medication adherence (Johnson, Driskell,
Johnson, Dyment et al., 2006). The TMC intervention was found to be efficacious at moving study participants from the pre-contemplation stage to the action stage at the end of the intervention and at the 18-month follow up. The overall findings suggested that the TMC intervention was significantly effective in improving cholesterol medication adherence with this adult sample.

Although medication adherence produced statistically significant findings in controlling BP in previous research, the majority of the research studies failed to utilize a theoretical framework. Furthermore, most researchers who conducted intervention studies appeared to assume that all participants who received the interventions were ready to change their behavior; and few of the studies reviewed included an assessment of the enrollees’ level of readiness for change. Therefore, non-significant results may have been due to the participants’ characteristics such as the lack of motivation or readiness to change.

The TMC stage of change construct has been used successfully with smoking cessation programs for more than three decades. A recent review of eleven studies published within ten years was conducted by Ficke and Farris (2005). They reported that there is not enough evidence available to determine whether the TMC is effective in reducing poor medication adherence. These authors recommended further research on medication adherence using the TMC (Ficke & Farris).

Medication Adherence

Many factors may contribute to poor BP control, but findings of several studies have suggested that non-adherence to BP medication is a key factor in BP management.
Clinical trials findings have indicated that target BP control, as indicated by the JNC 7, can be obtained with medication adherence (Chobanian et al., 2003; Hynes & Sackett, 1976). Of note is that Bramley and colleagues (2006) believe that their research was the first to establish a relationship among medication adherence and BP control.

Some physicians blame patients for the poor BP control rates as seen in many studies (Pickering, 2008). However, several studies have suggested that barriers to medication adherence are created by patients (Harmon, Lefante, Krousel-Wood, 2006; Stilley, Sereika, Muldoon, Ryan, Dunbar-Jacob, 2004), physicians (Kotchen et al., 1998; Okonofua, Simpson, Jesri, Rehman, & Egan, 2005), as well as health care systems (Harmon et al., 2006; Kotchen et al., 1998; Ward, Morisky, Lees, & Fong, 2000).

Although medication adherence in hypertension control has not been well studied, but there have been a few prospective and retrospective studies conducted (Bramley et al., 2006). For example, Lee, Grace and Taylor (2006) conducted a randomized control study to determine the association between medication adherence and BP control with men (155) and women (45) older than 64 years of age. These men and women from a military hospital were randomized to an intervention or control group. The intervention group received counseling from a pharmacist and a blister packet of their daily medications and the control group received usual care. The results of this study indicated that a multi-focal intervention including both an educational and structural component (the provision of the blister packet) could improve medication adherence in the elderly. The researchers concluded that additional studies are needed to examine the relationship of medication adherence and BP control.
Patel et al. (2006) investigated medication adherence in 2098 elderly volunteers who received one of five variations of a combination drug regime (statin drugs plus a calcium channel blocker). Using claims data over six months, the investigators found that participants who received a single drug combination were more likely to be adherent to their medications as defined as taking medications at least 80% of the time. A limitation of this study was the use of claims data, which is a restricted method for assessing patients’ medication adherence.

Ho and colleagues (2008) conducted a retrospective study in a managed care setting with 10,447 individuals with coronary disease and uncontrolled BP. The purpose of the study was to examine the relationship between BP medication non-adherence and aggressive medication treatment with individuals at Kaiser Permanente of Colorado (Ho et al., 2008). Non-adherence was defined as medication taken less than 80% of the time. Results indicated that individuals who had uncontrolled BP were more likely to be those who were treated aggressively and who had poor medication adherence. Thus, poor medication adherence was an important factor for uncontrolled BP in individuals that received aggressive medication treatment. Ho and colleagues’ (2008) study supports the previous research findings that medication adherence is associated with BP control. However, the authors failed to examine the association between the number of BP medications and the medication adherence rate.

Morisky and colleagues (1983) conducted an 18 month randomized factorial intervention study with hypertensive individuals (120 men and 280 women) from an outpatient clinic. The majority of participants were black (36%) and the average age was 54. The purpose of the investigation was to test the effectiveness of an educational
interview intervention for hypertensive individuals. The findings suggested that the educational intervention significantly improved BP control in this population. Those individuals that consistently followed-up in the physician’s office were adherent to their medications and their BPs were controlled. The researchers recommended patient centered interventions followed by an appropriate assessment (Morisky et al.).

Although many intervention studies have focused on medication adherence and BP control using several types of educational and behavioral interventions, the majority of findings indicate that only a combination intervention demonstrated any signs of improved medication adherence. A systematic review conducted by Haynes, Ackloo, Sahota, McDonald, and Yao (2008) suggested that results varied in intervention studies that were focused on improving medication adherence and that only about 50 percent of the studies demonstrated improvement. Authors from these reviews agreed that further research focused on innovation is needed to assist individuals improve their medication adherence (Haynes et al., 2008).

Bosworth et al. (2008) conducted a randomized interventional study called Take Control of Your Blood Pressure (TCYB) that included African American participants. TCYB had 319 hypertensive participants with the average age of 61. Forty-seven percent of the intervention group was African American and 51% of the control group was African American. The researchers developed a multi-focal intervention that involved modules addressing specific health behaviors associated with hypertension (medication adherence and side effects, memory, knowledge, participatory decision making, diet, weight, exercise, social and medical environment, stress, smoking, alcohol, literacy, and
knowledge of their target BP). The behavioral-educational intervention was based on the Health Decision Model (HDM) and the Transtheoretical model.

During the TCYB study, a nurse would assess each individual in the intervention group every eight weeks and would implement the intervention module based on the individual needs via a phone call. The individual was also allowed to call the nurse with concerns associated with their hypertension. The TCYB nurse-administered telephone intervention lasted approximately 18 minutes and the control group received usual care only. Both the intervention and control group were followed at six months and 24 months and blood pressures were obtained as the outcome measure. Results of the study indicated that the intervention improved medication adherence by 8% when compared to the control group (intervention group 69% and control group 61%). Because these were preliminary results at 6 months of a 24 month study, the analyses did not include whether the difference was significant. In addition, the authors did not note if the medication adherence improvement influenced BP control.

A few prospective randomized studies have investigated medication adherence and BP control. Shah, Steiner, Vermeulen, Flemings, and Cory (2007) conducted a retrospective cross sectional randomized controlled study to determine the impact of medication adherence on BP control in 708 adults with a prescription drug benefit as part of their health insurance plan. Data were extracted from the individuals’ medical record. There were no significant differences in blood pressure control between individuals with medication adherence and those with poor medication adherence. Their findings demonstrated that medication adherence was not associated with BP control, but the
authors noted that several methodological limitations that may have affected the results including use of claims data and use of last BP of the year as a replacement for mean BP.

Over two decades of evidence suggest that medication adherence is predictive of blood pressure control, but further investigation is needed to explore this issue especially among African Americans. Because of conflicting results in the literature, more studies are needed to examine the relationship between medication adherence and blood pressure control.

Self-Efficacy

Self-efficacy is a construct of the TMC based on the work of Bandura (1982, 1986). According to Bandura (1986), cognitions can determine actions and explain human behavior. Self-efficacy, the thoughts of one’s’ belief in the ability to perform an action, is domain and population specific. Instruments designed to capture self-efficacy must be specific for the behavior of interest, situations, and ideally must be tested among members of the target population.

Self-efficacy has been established as the most prominent predictor of health-related behavioral change (Bandura, 1986; Burs et al., 1999). Many studies have focused on self-efficacy for health-related behaviors but few published studies have focused on this psychosocial variable in medication adherence research (Sallis et al., 1992; Walcott-McQuigg & Prochaska, 2001).

Self-efficacy has been shown to predict medication adherence in persons with chronic diseases (Ogedegbe et al., 2003). Studies suggest that participants with hypertension who have high levels of self-efficacy are more likely to feel confident to
perform health-related behaviors, such as adhering to their medications (Auamnoy, 1999; Kobau & DiIorio, 2003; Ogedegbe et al., 2003). The belief that one can adhere to BP medication in specific high risk situations is a measure of medication adherence self-efficacy, and controlling one’s BP is the ultimate outcome.

Self-BP Monitoring

Physicians do not routinely recommend self-BP monitoring. Nevertheless, monitoring BPs outside of the physicians’ office is increasing among persons with hypertension. Recent randomized clinical trial findings have suggested that home BP monitoring significantly influences BP control (Cappuccio, Kerry, Forbes, & Donald, 2004). In addition, community based monitoring has been found to be as effective as home-monitoring, without the cost of purchasing a home monitor (Artinian, Washington, & Templin, 2001; Tobe, Pylypchuk, Kiss, Szalai, & Hartman, 2006).

Generally, BP readings are variable and are usually lower at home than at the physician’s office. It has been estimated that 10-20% of persons diagnosed with hypertension have elevated BPs only in the physicians’ office (white coat syndrome), and there are a number of individuals who have normal BPs in the doctor’s office but have elevated BPs elsewhere (masked hypertension). Hypertension management is dependent upon an accurate and frequent measurement of BPs because antihypertensives may need to be adjusted based on each individual’s response to the medication.

Prior to 1993, there was a lack of strong evidence in support of BP monitoring outside of the physician’s office. Therefore, the American College of Physicians (1993) did not recommend routine use of BP monitoring outside the physician’s office. Since
then, findings from evidence-based medicine led to the inclusion of recommendation for home BP monitoring use in addition to usual care in the JNC 7 (Chobanian et al., 2003). Likewise, the European Society of Hypertension–European Society of Cardiology (ESH–ESC) has suggested home BP monitoring as a supplement to office BP monitoring (Fahey et al., 2007). Currently, the American Heart Association, American Society of Hypertension and the Preventive Cardiovascular Nurses’ Association have issued a joint statement of recommendation for routine home BP monitoring among hypertensive patients.

Burns-Cox, Rees, and Wilson (1975) conducted a pilot study with 48 hypertensive patients 20-60 years of age to examine whether selected hypertensive patients could monitor their BPs at home. In addition, these investigators wanted to compare home readings with the physician office readings, and determine if depression or anxiety was a factor in patients monitoring their BP as well as make recommendations regarding the usefulness of home BP monitoring. Their findings demonstrated that some patients can effectively monitor their BPs at home, that there were no significant differences between the patient’s readings and the physician readings, and that depression or anxiety was not significant factors in BP control. However, the Burns-Cox et al. (1975) study had a major flaw. Over half of the participants were excluded due to disability or not cooperating with the protocol. This reduced the sample size to 24 instead of 48 and only 8 of the 24 participants completed the study. Therefore, a significant difference may not have been detectable due to lack of power. The authors attributed the attrition rate to patients’ inability to comply with appointments due to old age or the ability to get to the clinic.
Midanik, Resnick, Hurley, Smith, and McCarthy (1991) conducted a longitudinal experimental study that examined the influence of home BP monitoring on BP control, medication treatment, reduction of risk factors and the use of health care services in 204 mildly hypertensive (SBP < 180/DBP > 89 and < 100) patients that were un-medicated. These patients were members of the Kaiser Foundation Health Plan, Oakland, California and physicians and nurses referred them to the study. Patients were randomly assigned to either the home BP monitoring group or the usual care group and monitored for one year. The groups were found to be similar in characteristics (average age 47; approximately half were males and African American, and at least 80% were employed and rated their health status as good or excellent). The patients’ BPs were measured at baseline and at the end of the study.

No significant differences were found between the intervention and control group for level of BP (even when stratified by sex, race, age and family history), initiation of medication treatment, risk factor reduction or use of health care, which suggested no benefit from home BP monitoring for this population. A major flaw in the Midanik et al. (1991) study was that the control group was told not to monitor their BPs, which may have caused them to monitor their BPs at home or carefully monitor their office BP measurements. Some control patients admitted to monitoring their BPs at home. However, patients that did not admit to monitoring their BPs at home may have been reluctant to reveal this information to the researchers because they were told not to do so.

A large prospective study with two phases was conducted by Bobrie et al. (2004) to evaluate the benefit of home BP monitoring compared to office BP monitoring. The sample consist of 4939 of men and women older than 59 years of age who had a BP
reading > 140/90 at two separate visits or who were already receiving drug treatment for hypertension. Each participant’s BP was measured on two separate visits two weeks apart over three years. Cardiovascular morbidity and mortality were the outcome variables. The findings of the study suggested that home BP monitoring was superior to office BP monitoring in preventing cardiovascular morbidity and mortality. The researchers also reported that 9% of participants who had controlled BP measurements in the office were found to be uncontrolled at home.

Canzanello, Jensen, Schwartz, Worra and Klein (2005) conducted a longitudinal intervention study with 106 individuals, mostly white (96%) men and women (58%), who were referred to the specialty clinic to receive drug treatment for uncontrolled BP. Automated baseline and follow up BP readings were used in the analyses. Findings suggested that the use of home BP monitoring in addition to use of a physician-nurse team improved individuals’ adherence to medication treatment.

In addition, self-BP monitoring has been shown to be effective in improving BP control in randomized control trials (Burke, Dunbar-Jacob, & Hill, 1997; Vrijens & Goetghebeur, 1997; Chobanian et al., 2003). The premise is that obtaining personal BP measurements may cue individuals to adhere to medications and seek medical follow-up advice. Cappuccio et al. (2004) conducted a meta-analysis of 18 randomized control trials to determine the impact of home BP monitoring on BP levels and the control of hypertension. The study’s outcome measure under investigation was a change in BP (DBP, SBP, and mean arterial pressure). The researchers analyzed results of hospital-based clinic studies (6), community and general practices studies (8) and mixed settings (4 studies). The findings indicated that the home BP monitoring group had a systolic and
diastolic blood pressure of 4.2 / 2.4 mmHg lower BP than the office-monitoring group (Cappuccio et al., 2004). Further, the home BP monitoring group was more likely to be controlled than the office group.

According to the evidence available, self-monitoring may have other benefits as well. First, it has been found to be a more accurate measurement of systolic and diastolic BP than office BP monitoring (Baguet & Mallion, 2002; Yarows et al., 2000). In addition, self-monitoring predicts cardiovascular mobility and mortality (Baguet & Mallion; Yarows et al.). Adequate treatment of hypertension involves meeting and maintaining target BP goals (Douglas et al., 2003). Facilitating patients’ independence in disease management may be necessary for adequate BP control (Lenz & Shortridge-Baggett, 2002) to decrease stroke, end stage renal disease and cardiovascular morbidity and mortality.

Office BP monitoring might be the least accurate of all readings, which is evident in “white coat syndrome” and masked BP. Measuring individuals’ BP only in the office can result in overestimates due to the effects of the BP medication and underestimates based on the “white coat syndrome,” which leads to over or under treatment (Redon et al., 1998; Raccaud et al., 1992) of individuals. While home BP monitoring probably will not replace office BP monitoring, there is strong empirical evidence that it is a valid and reliable method for the diagnosis and management of BP.

The majority of the studies reviewed failed to use a theoretical model to guide their research and have not investigated multiple factors which may predict the control of blood pressure. An aim of this study was to use the Transtheoretical Model of Change as a conceptual model to examine stage of change, medication adherence, medication
adherence self-efficacy, self-blood pressure monitoring and personal factors as possible predictors of blood pressure control in city workers with hypertension. Another aim of this study was to explore the contribution of stage of change, medication adherence, medication adherence self-efficacy and personal factors on self-monitoring of blood pressure.

Summary

The literature review provides empirical evidence that medication treatment is beneficial to prevent cardiovascular events and medication adherence is positively related to BP control in individuals with hypertension. Few studies have investigated stage of change in relation to antihypertensive medication adherence. Although many studies have demonstrated that self-efficacy contributes to healthy behaviors, only a few studies have been conducted concerning medication adherence self-efficacy (Ogedegbe et al., 2003). In addition, no studies were found that focused on stage of change, medication adherence, medication adherence self-efficacy and personal factors as predictors of self-BP monitoring. Further, medication adherence is not clearly understood and the most significant factor or factors that contribute to the problem of poor medication adherence and BP control are unknown. To date, however, no research has been reported on whether medication adherence self-efficacy, self-BP monitoring and stage of change have an influence on workers’ BP control.

The problem that was investigated was to identify which selected behavioral, psychological, and personal factors are predictive of blood pressure control and self-monitoring in city workers with hypertension. In addition, the researcher examined to what extent self-BP monitoring predicts BP control. Uncontrolled BP is a complex and
significant clinical topic, but ultimately a better understanding is needed to assist individuals to take control of their treatment and adhere to their BP medications. Controlling BPs in city municipal workers could potentially decrease health risks and medical care costs and enhance the overall quality of life among this population.
CHAPTER 3

METHODS

In this chapter the details of the research methodology will be discussed. The research design, sample and setting, procedure for collection of data, instruments, methods of data analysis, potential impact, and study limitations are presented.

Design

A non-experimental, cross sectional correlational design was utilized to examine the relationships among stage of change, personal factors, medication adherence self-efficacy, medication adherence, the frequency of home BP monitoring and BP control in workers with hypertension; and to determine the best predictive models for home BP monitoring and BP control. Correlational research is appropriate for this study because of the need to explore a wide variety of relationships (Brink & Wood, 1998). The independent variables included specific personal factors (age, gender, race, education, and marital status), stage of change, medication adherence self-efficacy, and medication adherence. Dependent variables included home BP monitoring and BP control.
Sample and Setting

Characteristics of the Sample

City workers who reported having been told that they have hypertension and who attended the City of Birmingham Good Health Program screening for their health risk assessment were invited to participate in this study. To help ensure an adequate level of study participation, data for this study were collected at a regularly scheduled Good Health Program screen held at a convenient City of Birmingham location. The Good Health Program participants have been screened at this same designated location for several years.

The City of Birmingham employee population was the focus of this study because 28.2% of the City of Birmingham employees were found to have uncontrolled BP among the 2000 city workers who participated in the Good Health Program screening in 2004. Of this group, approximately one-half were taking medications for their hypertension, and one-half were not on medications. This percentage was similar to the national average. Despite having access to care and being aware of their hypertension, similar results were found in the 2008-2009 Good Health Program screening of 3357 workers, in which 26.5% of city workers were found to have blood pressure readings greater than 140/90. Of those with uncontrolled hypertension, 47.6% \( (n = 424) \) were on antihypertensive medications, while 52.4% \( (n = 466) \) were not on medications.

City workers were included in this study if they (a) were participating in the Good Health Program, (b) self-reported that they were told by a health care provider at least once that they have high BP and that they were taking blood pressure medication, and (c) were above the age of 19. Individuals were excluded if they were unable to read, speak,
and write English because they would not be able to comprehend and communicate responses on the questionnaires.

**Sample Size Justification**

Power and sample size for logistic regression were calculated based on the guidelines by Peduzzi, Concato, Kemper, Holford, and Feinstein (1996). The standard statistical power of 80% and a significance level of 0.05 (two-sided test) was used because both are standards in the social sciences. Assuming a model of six predictor variables, with an effect size of .33, multiplying the number of predictor variables by 10 and dividing by the effect size, the required sample size for this study was 182 subjects.

**Ethical Considerations**

An application for expedited review was submitted to the Institutional Review Board of the University of Alabama at Birmingham. During recruitment, individuals who met criteria for inclusion were invited to participate and told that participation in the study was completely voluntary. An explanation was also provided that declining to participate in the study would not influence their screening in the Good Health Program or their employment. Individuals were informed that if they agreed to participate, they could withdraw from the study at any time without penalty. A cover letter was attached to the questionnaires that included the purpose of the study, eligibility, location of the study, what the participants were asked to do, and amount of time required to participate in the study. Return of the completed questionnaire packet indicated the volunteers’ informed consent.
Data Collection Procedure

Birmingham city workers participate at least every other year in health risk appraisal screening and are provided health education regarding life style modifications to reduce their risk factors for cardiovascular disease and death. As part of the screen, participants complete a standard questionnaire on current health behaviors and use of preventive health services. Additional questionnaires needed for this study were distributed to public safety workers with hypertension who were participating in the city of Birmingham Good Health Program screen in fall 2009, who met inclusion criteria, and who agreed to participate in the study. The questionnaires measuring stage of change, medication adherence, medication self-efficacy, and home blood pressure monitoring comprised the additional questionnaires (see Appendix A).

Measurement

The following questionnaires were used in the study: A modified Behavior Risk Factor Surveillance System (BRFSS) questionnaire, Stage of Change Questionnaire, Morisky Medication Adherence Scale (MMAS), Medication Adherence Self-Efficacy (MASES) Scale, and the Good Health Program Health Questionnaire.

*Modified Behavior Risk Factor Surveillance System Questionnaire*

A modified questionnaire was used to assess the frequency of self-BP monitoring at home and in the physician’s office. Specific questions were selected from the Behavior Risk Factor Surveillance System (BRFSS) (CDC, 2008) questionnaire for blood glucose monitoring because this instrument is widely used to collect data on health risk behaviors.
in research conducted by the CDC. The words “high blood pressure” were used instead
“blood sugar” to address hypertension management.

Additional questions concerning the nature and knowledge of target blood
pressure levels was included to provide additional information concerning self-BP
monitoring. Questions were as follows: “Are you using a blood pressure monitor at home
(to help monitor your blood pressure)?”; “About how often do you check your blood
pressure?”; “About how many times in the past 12 months have you had your blood
pressure measured by a doctor, nurse, or other health professional within your doctor’s
office?” Three additional questions based on the literature were added to the BRFSS
questionnaire and are as follows: “How long have you had high blood pressure?”; “How
many times a day do you take your blood pressure medication?”; and “What are your
target (normal) blood pressure numbers?”

Stage of Change Questionnaire

Stage of change was measured with a brief questionnaire that has been useful for
obtaining motivational readiness to change or the stage of change (Prochaska, Norcross,
& DiClemente, 1994). Prochaska and DiClemente (1994) developed statements to be
used initially in smoking cessation and addiction research. These statements have been
used with a broad array of problem behaviors including gambling, alcoholism, troubled
drinking, high risk sex, depression, panic attacks, physical abuse, obesity, high fat diet,
sedentary life style, dental hygiene, procrastinating, and sun exposure.

Prochaska and colleagues’ (1994) statements were used to collect data on
motivation in this study because they are (a) widely used in research regarding behavioral
change, and (b) are simple to use as suggested in a self-help book written by the authors for individuals interested in changing unhealthy behaviors without professional care.

Another instrument that was considered to measure motivational readiness for this study was used by Johnson, Driskell, Johnson, Prochaska et al. (2006) in an investigation of adherence to antihypertensive medication. Although this instrument was appropriate for the current study, it was not feasible to use because of its high cost.

The Stage of Change statements were modified for use with hypertensive patients by including the words “blood pressure medication” and “at least 80 % of the time or more,” which was suggested by Dr. DiClemente when obtaining permission to use the statements. Each statement has a dichotomous answer choice of “yes” or “no” that assesses motivational readiness to change; and the four statements which require 5-10 minutes to complete are as follows: 1) I have been taking my blood pressure medication as my doctor prescribed for more than 6 months; 2) I have been taking my blood pressure medication everyday at least 80 % of the time in the last 6 weeks; 3) I intend to take my blood pressure medication everyday at least 80 % of the time or more in the next 30 days; and 4) I intend to take my blood pressure medication everyday as my doctor prescribed at least 80 % of the time or more in the next 6 months.

As recommended by Prochaska et al., (1994), the statements were used to categorize each participant into one of five stages of change. The algorithm was scored as follows: Pre-Contemplation = “No” to all statements; Contemplation Stage = “Yes” to statement 4 only; Preparation Stage = “Yes” to questions 3 and 4 and “No” to the others; Action Stage = “Yes” to statement 2 and “No” to statement 1; and Maintenance Stage = “Yes” to statement 1.
Individuals in the pre-contemplation stage for medication adherence are those who are non-adherent to their BP medications everyday or on some days and have no intention to adhere at least 80% within the next 6 months. Contemplation for medication adherence is the identified stage for individuals who are non-adherent to their BP medications everyday or on some days and are thinking about adhering within the next 6 months. Individuals in the action stage for medication adherence are those who are adherent to their BP medications everyday and have been adherent for less than 6 months. Finally, individuals in maintenance stage for medication adherence are those who are adherent to their BP medications everyday and have been adherent for more than 6 months (Prochaska, Norcross, & DiClemente, 1994).

The Morisky Medication Adherence Scale

Medication adherence was measured using the Morisky Medication Adherence Scale (MMAS) developed by Morisky, Ang, Krousel-Wood, and Ward (2008). The MMAS is a self-reported, eight-item, Likert-type scale in which a cut off score of < 6 is used to indicate poor medication adherence. Medication adherence was classified in three categories as recommended in the literature (Morisky et al., 2008): 8 = high medication adherence, 6 to < 8 = medium medication adherence, and < 6 = poor medication adherence.

The MMAS was developed from a 4-item instrument that was validated with low income African Americans with hypertension. Additional questions were added to the 4-item instrument to assess factors that might influence medication non-adherence (Morisky et al., 2008). The eight items consists of seven dichotomous selection of yes or
no to measure specific medication adherence behaviors. The eighth question on the MMAS assesses the frequency of remembering to adhere to the medication regimen with response choices ranging from never/rarely (0), once in a while (1), sometimes (2), usually (3), and all the time (4).

To assess the reliability and concurrent and predictive validity of the MMAS, a randomized experimental pre-post-test study was conducted over one year at a large teaching hospital. Because previous research suggested an association between medication adherence and BP control, knowledge, social support, stress, and individuals’ satisfaction with clinic visits, these variables were used to determine the predictive validity of the MMAS (Morisky et al., 2008). In a study of fourteen hundred individuals with hypertension (76.5% African American), the reliability coefficient of the MMAS was found to be .83 (Morisky et al., 2008).

Concurrent validity was measured using the Pearson correlation coefficient and the item-total correlations were more than 0.30 for each question. The 8-item instrument was highly correlated (0.64; p< 0.5) with the previously validated 4-item scale (Morisky et al., 2008). The MMAS was found to be reflective of the medication adherence construct (Morisky et al., 2008). The cut point was carefully set at < 6 based on the assessment of the sensitivity and specificity of the instrument to identify individuals with poor BP control. Other scales have been used to measure medication adherence, but the MMAS instrument has been widely used in hypertensive research and it takes approximately 3 minutes to complete.
The Medication Adherence Self-Efficacy Instrument

The Medication Adherence Self-Efficacy (MASES-R) Scale was developed to assess situations in which patient have low confidence that they can adhere to their medications (Ogedegbe et al., 2003). The MASES-R is a 13-item instrument with 3-point Likert-type response scale (1 = not at all sure, 2 = somewhat sure, and 3 = very sure). A total score is obtained by adding each item score to create a continuous measure of medication adherence self-efficacy (Fernandez et al., 2008). A higher score indicates a higher self-efficacy for medication adherence.

The development of the MASES-R involved qualitative and quantitative research methods. Initially qualitative information was gathered from 106 African Americans regarding their medication taking habits. Forty-three questions were derived from the analysis of these formative data.

A quantitative method was used to test the scale further. The 43-item scale was administered to 72 African Americans (mean age = 56 years, 66% female) and 21 items were found to be well correlated (0.5). Five clinically significant items were added to yield a 26-item scale to assess participants self-report of how confident they were in adhering to their medication treatment during difficult situations. The MASES was found to have high internal consistency, with a Cronbach’s alpha of 0.95 (Ogedegbe et al., 2003).

Recently, a study conducted by Fernandez et al. (2008) confirmed the psychometric testing of the MASES. One hundred and sixty-eight African Americans with hypertension (mean age = 54, 92% insured) participated in the study. Using exploratory and confirmatory factor analysis procedures and classical test theory, the
MASES was found to be unidimensional and reliable with a test-retest coefficient = 0.51 (p < 0.001) and Cronbach’s alpha coefficients of 0.92 at baseline and 0.90 at 3 months (Fernandez et al., 2008). The scale’s predictive validity was tested using the Medication Event Monitoring System (MEMS), an electronic measure of medication adherence that has been named the gold standard for measuring medication adherence. Following this study, the 26-item instrument was revised to create the MASES-R, a 13-item revised instrument. Twelve of the items assess an individual’s confidence in taking medication in particular situations and one item asks about the ability to routinely take medications (Fernandez et al., 2008). Because the MASES-R was also found to be reliable, valid and one-dimensional, this briefer instrument was used in this study as opposed to the longer original version of the MASES. The 13-item MASES-R takes only about 3 minutes to complete.

**Blood Pressure Control and the Good Health Questionnaire**

Prior to the BP measurement, participants were fitted with the appropriately sized cuff systolic and diastolic BPs after 5 minutes of rest with a validated, automated, upper arm digital instrument. The device automatically takes two measurements, three minutes apart, which are collected and recorded. The lower measurement was utilized as the BP score for this study. Controlled BP was defined according to the JNC 7 (2003) guidelines as BP < 140/90 mm (Bosworth et al., 2007). Follow-ups and referrals were made as indicated according to the Good Health Program protocol that has been in place since 1991. Blood pressure was analyzed for SBP control, DBP control, and both SBP and DBP control as indicated in the literature (Shah et al., 2007).
Selected demographic data, information regarding history of hypertension, medications, and health behavior-related variables were collected using the Good Health Program Questionnaire. Permission to use a de-identified limited data set extracted from the questionnaire was requested prior to conducting the study. Only the information specific to this study was extracted from the questionnaire to be used for data analyses. These data were used to examine relationships between medication adherence and selected demographic and background variables and to provide an overall picture of the convenience sample. The following information was extracted from the larger questionnaire: department, age, race, gender, marriage status, highest grade completed, history of hypertension, years of hypertension, diabetes, taking antihypertensives, class and number of antihypertensives, taking medications for other diseases, weight, waist circumference, and height.

Data Management and Analyses

Each item in the questionnaires was checked for completion and if questionnaires were incomplete, they were included in the study only if missing items were less than 20%. Coding and double-checking were performed by the investigator. Data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 16 software program. Descriptive statistics, including frequencies, percentages, means and standard deviations, were used to examine the distributions of variables in this study. In addition, instrument reliabilities for the medication adherence and the medication adherence self-efficacy questionnaires were assessed using Cronbach’s alpha. All hypotheses were tested at a .05 significance level.
Research question 1 (What is the prevalence of self-blood pressure monitoring, blood pressure control, and medication adherence in workers with hypertension?) was examined using frequencies and percentages.

Research question 2a [Is there a difference in medication adherence by stage of change (pre-contemplation, contemplation, preparation, action, and maintenance)?], and 2b (Is there a difference in medication adherence self-efficacy by stage of change?) were planned to be examined using one-way ANOVA.

Research question 3 (What is the bivariate relationship between medication adherence and medication adherence self-efficacy?) was planned to be examined using a Pearson correlation coefficient.

Research question 4a (Is there a relationship between stage of change and blood pressure control?) and 4b (Is there a relationship between stage of change and self-blood pressure monitoring?) were examined using chi square analyses.

Research question 5 (What are the relationships between medication adherence self-efficacy and blood pressure control and self-blood pressure monitoring?) was also examined using chi-square analyses.

Research question 6 (What is the best predictive model for blood pressure control in workers with hypertension using stage of change, medication adherence self-efficacy, medication adherence, and personal factors?) was examined using logistic regression (see Figure 2).

Research question 7 (Does the inclusion of self-blood pressure monitoring improve the predictive ability of the above model?) was examined using logistic regression (Figure 2).
Research question 8 (What is the best predictive model for self-blood pressure monitoring using stage of change, medication adherence self-efficacy, medication adherence and personal factors?) was also analyzed using logistic regression (Figure 2).

Study Limitations

Several limitations to the study must be noted. First, the sample was one of convenience; thus, volunteers who may be different from those who do not volunteer to participate in a study on blood pressure control. Second, the self-report instruments are subject to possible socially desirable answers and recall bias. However, self-report instruments that are valid and reliable are feasible because they are relatively easy to administer and are inexpensive to use in clinical-like settings. Finally, the investigation was a correlational study that cannot yield causal relationships. The results of the study can only yield information about whether relationships exist among the variables and the extent of the relationships. Nevertheless, correlational studies are useful in the study of relationships among variables that are not easily manipulated, and this type of research design allows the researcher to explore a wide variety of relationships simultaneously (Brink & Wood, 1998).
Figure 2. Logistic regression models
CHAPTER 4

FINDINGS

This chapter provides study results from analysis of the data. The first section presents the sample characteristics. Frequencies and percentages were used to describe demographics such as age category, gender, race, marital status, and educational level; clinical characteristics, including those related to blood pressure status and antihypertensive medications; and categorical study variables, including self-monitoring of blood pressure and stage of change. Means and standard deviations were calculated to examine the continuous variables including age, years diagnosed with hypertension, medication adherence and medication adherence self efficacy scores. The next sections present the findings from analyses of the research questions in this study.

Description of the Sample

A total of 752 municipal employees were screened in the fall of 2009. A total of 183 employees were invited to participate in the study based on responses to verbal questions regarding the inclusion criteria. A packet that included the existing Good Health Program Questionnaire and four additional questionnaires was distributed to workers who self-reported that a health care professional had told them they had hypertension and that they were prescribed antihypertensive medication.

A total of 27 participants were excluded after questionnaires were collected. Review of the questionnaires indicated that eleven participants did not respond that they
were told they had hypertension. Six of the eleven denied taking antihypertensive medication in addition to not being told they had hypertension. The remaining five stated they were taking medications and indicated their antihypertensive medication type. Fifteen participants reported that they were not taking antihypertensive medications and one was not sure. Based on the inclusion criteria and the purpose of the study, these 27 participants were excluded. Upon examination, some of the participants were classified as normotensive, prehypertensive, and not taking medications. However, in order to be included in this study, participants must have been hypertensive and taking antihypertensive medication. Therefore, the participants that were normotensive, prehypertensive and not taking medications (n=31) were also excluded from the analyses. The remaining 149 participants were entered into the study. The completion of the packet and attendance at the screenings indicated the employees’ willingness to take part in the study.

Descriptive statistics for the sample are presented in Table 1. Most participants were male (85.10%), black (71 %), married (69.40%), average age 47 years ($SD = 8.42$) with some college education (49.30%). More than one third of the sample (35.10%) were college graduates or post graduates. In addition, roughly one-third of the participants had been diagnosed with hypertension less than one year (36.20%), and approximately half had been prescribed medication in the “combination class” of antihypertensives (49.70%).
Table 1

Demographic and Clinical Characteristics of the Sample (N = 149)

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<td>132</td>
<td>89.2</td>
</tr>
</tbody>
</table>
The Good Health Program staff measured participants’ blood pressures after the participants had a five-minute rest period. Using a validated clinical automated blood pressure device and an appropriate size cuff, two blood pressure measurements were averaged. More than three-quarters of the participants had controlled blood pressure (75.70%), while 24.30% of them had uncontrolled blood pressures. The majority of participants selected <130/80 as their target blood pressures (42.30%). Most participants (87.80%) denied being diabetic and taking diabetic medication (89.2%). The most frequently reported selection for number of antihypertensive medication and the frequency of medication regimen was one pill (71.10%) and once a day medication regimen (87.20%). A substantial majority self-reported a family history of hypertension (93.20%).

Using the instructions provided by the authors of the Stage of Change Scale for medication adherence, each participant was classified according to the algorithm. Most participants were in the maintenance stage (88.50%; n=123), 5.0% (n=7) were in the preparation stage and 6.50% (n=9) were in the precontemplation stage of change. The maintenance stage required that the participant report taking their medication at least 80% of the time for more than 6 months. The vast majority of the participants classified in the maintenance stage in this study also indicated that they took their medications at least 80% of the time for the last 6 months, and they reported their intentions to take their medications at least 80% of the time in the next 30 days and the next 6 months.

The Morisky Medication Adherence Scale used for this study consists of 8 items. Although the 4 item scale is widely used in the literature, the 8 item scale has been shown to be significantly correlated ($r = 0.64, p < .05$) with the original validated 4 item scale
(Morisky et al., 2008). As indicated in the literature, the possible scores for the Morisky Medication Adherence Scale range from low (scores = 0-5), to medium (scores = 6-7), to high (scores = 8), with cutpoints carefully chosen by the scale authors based on the relationship with blood pressure control to be useful in the clinical setting (Morisky et al., 2008).

The lead author of the Medication Adherence Self-Efficacy (MASE-R) instrument recommended using tertiles to define low (3.00), medium (3.92) and high (4.00) self efficacy. In the current study low medication adherence self-efficacy was found in 40 participants (29.4 %), 31 (22.8%) had medium medication self efficacy, and 65 of the study participants (47.8%) had high medication adherence self efficacy. As seen in Table 3, mean scores for medication adherence and medication adherence self-efficacy were in the low to moderate range (5.99 and 3.47), respectively.

Table 2

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controlled</td>
<td>112</td>
<td>75.7</td>
</tr>
<tr>
<td>Uncontrolled HPN</td>
<td>36</td>
<td>24.3</td>
</tr>
<tr>
<td>Stage of Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Contemplation</td>
<td>9</td>
<td>6.5</td>
</tr>
<tr>
<td>Contemplation</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Preparation</td>
<td>7</td>
<td>5.0</td>
</tr>
<tr>
<td>Action</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Maintenance</td>
<td>123</td>
<td>88.5</td>
</tr>
<tr>
<td>Self-BP Monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>103</td>
<td>70.5</td>
</tr>
<tr>
<td>No</td>
<td>43</td>
<td>29.5</td>
</tr>
</tbody>
</table>

Table 3
Surprisingly, participants who had uncontrolled blood pressure had a higher medication adherence mean score (6.07) than participants with controlled hypertension (5.97) who were taking medications (see Table 4). The same was true for medication adherence self-efficacy scores with mean scores of 3.57 and 3.44 among the uncontrolled and controlled blood pressure groups, respectively (see Table 5).

### Table 3

Range of Possible Scores, Observed Ranges, Mean, Standard Deviation for the Key Continuous Study Variables (N = 149)

<table>
<thead>
<tr>
<th>Study variable</th>
<th>Range of Possible Scores</th>
<th>Range of Scores in Sample</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morisky Medication Adherence Scale</td>
<td>0-8</td>
<td>0-8</td>
<td>5.99</td>
<td>1.96</td>
</tr>
<tr>
<td>Medication Adherence Self-Efficacy</td>
<td>0-4</td>
<td>1-4</td>
<td>3.47</td>
<td>721</td>
</tr>
<tr>
<td>Scale (MASE-R)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5

Medication Adherence Self-Efficacy by Blood Pressure Status among Municipal Workers (N = 149)

<table>
<thead>
<tr>
<th>Study variable</th>
<th>Range of Possible Scores</th>
<th>Range of Scores in Sample</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication Adherence Self-Efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controlled Blood Pressure</td>
<td>0-4</td>
<td>1.23-4.00</td>
<td>3.44</td>
<td>.772</td>
</tr>
<tr>
<td>Uncontrolled Blood Pressure</td>
<td>0-4</td>
<td>2.00-4.00</td>
<td>3.57</td>
<td>.532</td>
</tr>
</tbody>
</table>

Instrument Reliability

The internal consistency of the Medication Adherence Self Efficacy Scale and the Medication Adherence Questionnaire were assessed using Cronbach’s alpha coefficients. This technique is the most commonly used approach in research to determine the homogeneity of an instrument (Polit & Beck, 2004). Although a Cronbach’s alpha coefficient of greater than .7 is acceptable (George & Mallery, 2003), a value of .8 is recommended as a practical value (Gliem & Gliem, 2003). Reliability estimates of both instruments were acceptable (see Table 6) ranging from .74 for the Morisky Medication Adherence Scale to .97 for the Medication Adherence Self-Efficacy Scale.

Table 6

Cronbach’s Alpha Coefficients for Study Instruments

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Number of items</th>
<th>Cronbach’s alpha coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication Adherence Self-Efficacy Scale</td>
<td>13</td>
<td>.97</td>
</tr>
<tr>
<td>Morisky Medication Adherence Scale</td>
<td>8</td>
<td>.74</td>
</tr>
</tbody>
</table>
Results

This section contains the study results, which are listed with each research question. Descriptive statistics such as frequencies and percentages were used to answer the first research question. Nonparametric Analysis of Variance (ANOVA) was used to investigate the second research question. The third research question was examined using correlation. The fourth and fifth research questions were examined using chi-square analyses. Logistic regression analysis was the approach utilized to analyze the remaining research questions.

Research Question 1

What is the prevalence of self-blood pressure monitoring, blood pressure control, and medication adherence in municipal workers with hypertension?

The prevalence of these variables was described using frequencies and percentages. Self-blood pressure monitoring (Table 2) was a general question to describe a participant’s use of blood pressure monitoring outside of the physician’s office, including home blood pressure monitoring. Home blood pressure monitoring was examined separately to determine its usage in the current study participants (Table 7). The findings indicated that more than 70% of the participants (n=103) self-monitor their blood pressures at places other than their physicians’ office, and less than half (41.6%) monitor their blood pressures at home. In addition, almost half of the participants monitor their blood pressures at the pharmacy (48.0%), but very few participants monitor their blood pressures at church (3.4%) or at a friend’s home (2.7%). Approximately one out of four participants (24.8%) used blood pressure monitors at Wal-Mart to monitor their blood pressures, and one out of five participants (20.9%) has their blood pressure
monitored at a family member’s home. Nearly one third of the participants monitor their blood pressures at a fire station (32.4%). The health department (.6%), work (.6%) and school (.6%) were other sites that participants mentioned they used for blood pressure monitoring.

Table 7

<table>
<thead>
<tr>
<th>Location of Self-BP Monitoring among Municipal Workers (N = 103)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
</tr>
<tr>
<td>Pharmacy BP Monitoring</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Home BP Monitoring</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Fire Station BP Monitoring</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Wal Mart BP Monitoring</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Family’s Home BP Monitoring</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Church BP Monitoring</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Friend’s Home BP Monitoring</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

More than seventy-five percent of participants had their blood pressures controlled (75.7%), and approximately one-fourth (24.30%) of the participants had uncontrolled blood pressure (Table 2). All of these participants self-reported that they
were told that they had hypertension and that they were taking anti-hypertensive medication.

Medication adherence was measured using a validated revised Morisky scale, an eight item measure. Over a third of the participants (34.9%; n=52) were classified in the low medication adherence category, the same number (34.9%) was noted in the medium medication adherence category, and 45 participants (30.2%) were classified in the high medication adherence category.

**Research Question 2**

(a) Is there a difference in medication adherence by stage of change (pre-contemplation, contemplation, preparation, action, and maintenance), and (b) is there a difference in medication adherence self-efficacy by stage of change?

Among the five stages of change, participants in this study were classified into only three of the stages of change, Pre-Contemplation, Preparation and Maintenance, based on their responses to the Stage of Change Questionnaire (Table 2). However, the majority of the participants were in the Maintenance Stage of change, so that the group sizes were markedly unequal. In addition, the medication adherence and medication self-efficacy scores were negatively skewed. Because of the violation on the ANOVA assumptions, a nonparametric analysis using a Kruskal Wallis ANOVA was used to examine both parts of research question two. The findings are described in Table 8.

At the significance level of 0.05, there is adequate evidence to conclude that there is a difference among the stage of change based on the medication adherence scores. The null hypothesis of no association was rejected ($\chi^2 = 17.995, df = 2, p < .001$), indicating
there is an association between medication adherence and stage of change. Likewise, the null hypothesis of no association was rejected ($\chi^2 = 19.822, df = 2, p < .001$) for the second part of question two, indicating there is an association between medication adherence self-efficacy and stage of change. The participants in the Maintenance stage of change had a higher medication adherence (MMAS) mean score than the participants in the Pre-Contemplation and Contemplation stages. This was true for the medication adherence self-efficacy (MASE-R) mean score as well.

Table 8

**Associations for Morisky Medication Adherence Scale (MMAS) and Medication Adherence Self-Efficacy (MASE-R) with Stage of Change (N = 149)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Stage of Change</th>
<th>Mean</th>
<th>Kruskal Wallis Chi Square</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMAS</td>
<td></td>
<td></td>
<td>17.995</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Pre-Contemplation</td>
<td>4.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contemplation</td>
<td>3.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>6.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASE-R</td>
<td></td>
<td></td>
<td>19.822</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Pre-Contemplation</td>
<td>2.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contemplation</td>
<td>3.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>3.59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Research Question 3*

What is the bivariate relationship between medication adherence and medication adherence self-efficacy?
Initial analyses indicated that both variables were negatively skewed. Therefore, the bivariate association between medication adherence and medication adherence self-efficacy was examined using a Spearman correlation coefficient (Table 9). The findings suggest a significant positive linear relationship between medication adherence and medication adherence self-efficacy ($r = .549, p < .001$). The age of the participants was also positively associated ($r = .183, p < .05$) with medication adherence. However, years diagnosed with hypertension was not associated with medication adherence ($r = .134, p > .05$). Similarly, age of the participants was positively associated with medication adherence self-efficacy ($r = .255, p < .01$), but years diagnosed with hypertension was not associated with medication adherence self-efficacy ($r = .165, p > .05$).

Table 9

<table>
<thead>
<tr>
<th>Variables</th>
<th>MMAS</th>
<th>Y-DX</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication adherence self-efficacy (MASE-R)</td>
<td>.549**</td>
<td>.165</td>
<td>.255**</td>
</tr>
<tr>
<td>Morisky Medication Adherence Scale (MMAS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years diagnosed with hypertension (Y-DX)</td>
<td>.310**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**$p < .05$**

Research Question 4

(a) Is there a relationship between stage of change and blood pressure control, and (b) is there a relationship between stage of change and self-blood pressure monitoring?
The associations between blood pressure control and self-blood pressure monitoring with stage of change were initially examined using Chi square analyses. Subsequently, Fisher’s Exact Test was performed due to low expected frequencies. The null hypothesis of no association between blood pressure control and stage of change was not rejected ($p = .42$), indicating there was no association between blood pressure control and stage of change. However, the null hypothesis of no association between blood pressure monitoring and stage of change was rejected ($p = .01$), indicating there was an association between self-blood pressure monitoring and stage of change.

Research Question 5

Is there a relationship between medication adherence self-efficacy categories and (a) blood pressure control and (b) self-blood pressure monitoring?

A categorical measure was created for use in these analyses. The association between blood pressure control and self-blood pressure monitoring with medication adherence self-efficacy was examined using Chi square analyses. The null hypothesis of no association between medication adherence self-efficacy and blood pressure control was not rejected ($\chi^2 = 4.509$, $df = 2$, $p = .092$), indicating there was no significant association between medication adherence self-efficacy and blood pressure control. Likewise, the null hypothesis of no association between medication adherence self-efficacy and self-blood pressure monitoring was not rejected ($\chi^2 = 1.016$, $df = 2$, $p = .600$), indicating there was no significant association between self-blood pressure monitoring and medication adherence self-efficacy.
In addition to the analyses above, the relationship between medication adherence self-efficacy and home blood pressure monitoring was examined. The null hypothesis of no association was not rejected ($\chi^2 = 1.794, df = 2, p = .414$), indicating there was no association between medication adherence self-efficacy and home blood pressure monitoring.

Finally, the relationships between medication adherence (low, medium, and high) and (a) blood pressure control, (b) self-blood pressure monitoring, and (c) home blood pressure monitoring were examined using chi square analyses. The results were similar to the others above. In all three analyses, the null hypothesis of no association was not rejected, indicating there was no significant association between medication adherence and (a) blood pressure control ($\chi^2 = .160, df = 2, p = .924$), (b) self-blood pressure monitoring ($\chi^2 = 2.932, df = 2, p = .246$), and (c) home blood pressure monitoring ($\chi^2 = 1.003, df = 2, p = .607$).

**Research Question 6**

What is the best predictive model for blood pressure control in municipal workers with hypertension using stage of change, medication adherence self-efficacy, medication adherence as predictors, controlling for personal factors (age, gender, race, education and marital status)?

This exploratory examination utilized an all subsets multiple logistic regression approach. Collinerality diagnostics were run prior to this examination and the variance inflation factor (VIF) statistic indicated that there were no issues noted with multi-collinerality among the predictors.
Preliminary analyses to examine the bivariate relationships between blood pressure control and the set of proposed predictors (stage of change for medication adherence, medication adherence, medication self-efficacy, and blood pressure self-monitoring) revealed no significant relationships (see Table 10). In addition, no personal characteristics (age, race, gender, education, or marital status) were found to be significant univariate predictors of blood pressure control for this sample (see Table 10). Therefore, no further model development for blood pressure control was performed.

Table 10

*Bivariate Correlations for Blood Pressure Control with Predictor Variables (N = 149)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>n</th>
<th>r</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage of change</td>
<td>139</td>
<td>-.015</td>
<td>.863</td>
</tr>
<tr>
<td>Medication adherence self-efficacy</td>
<td>146</td>
<td>-.082</td>
<td>.324</td>
</tr>
<tr>
<td>Medication adherence</td>
<td>148</td>
<td>-.023</td>
<td>.785</td>
</tr>
<tr>
<td>Self-blood pressure monitoring</td>
<td>145</td>
<td>-.094</td>
<td>.263</td>
</tr>
<tr>
<td>Age</td>
<td>148</td>
<td>.054</td>
<td>.517</td>
</tr>
<tr>
<td>Gender</td>
<td>147</td>
<td>-.029</td>
<td>.729</td>
</tr>
<tr>
<td>Race</td>
<td>145</td>
<td>-.156</td>
<td>.060</td>
</tr>
<tr>
<td>Education</td>
<td>148</td>
<td>.180</td>
<td>.193</td>
</tr>
<tr>
<td>Marital status</td>
<td>148</td>
<td>.068</td>
<td>.414</td>
</tr>
</tbody>
</table>
Research Question 7

Does the inclusion of self-blood pressure monitoring improve the predictive ability of the above model?

Because preliminary analyses to examine the bivariate relationships between blood pressure control and the set of proposed predictors revealed no significant relationships, no further model development for blood pressure control was performed.

Research Question 8

What is the best predictive model for self-blood pressure monitoring using stage of change, medication adherence self-efficacy, medication adherence, and personal factors (age, gender, race, education, and marital status)?

Preliminary analyses to examine the bivariate relationships between blood pressure self monitoring and the set of proposed predictors (medication adherence, medication self-efficacy, and BP self-monitoring) revealed no significant relationships, with the exception that stage of change for medication adherence and race were significantly associated with self-blood pressure monitoring in this sample (see Table 11). When these two variables were included as a set in a logistic model, only stage of change remained significant (see Table 12.) The reference category for the stage of change variable was the precontemplation category; the reference category for the race variable was white.
Table 11

*Bivariate Correlations for Self-Blood Pressure Monitoring with Predictor Variables (N = 149)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>n</th>
<th>r</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage of change</td>
<td>136</td>
<td>-.204**</td>
<td>.016</td>
</tr>
<tr>
<td>Medication adherence self-efficacy</td>
<td>143</td>
<td>.043</td>
<td>.605</td>
</tr>
<tr>
<td>Medication adherence</td>
<td>146</td>
<td>.054</td>
<td>.511</td>
</tr>
<tr>
<td>Age</td>
<td>145</td>
<td>.095</td>
<td>.252</td>
</tr>
<tr>
<td>Gender</td>
<td>142</td>
<td>.069</td>
<td>.407</td>
</tr>
<tr>
<td>Race</td>
<td>142</td>
<td>-.232**</td>
<td>.005</td>
</tr>
<tr>
<td>Education</td>
<td>145</td>
<td>-.023</td>
<td>.778</td>
</tr>
<tr>
<td>Marital status</td>
<td>146</td>
<td>.130</td>
<td>.118</td>
</tr>
</tbody>
</table>

Table 12

*Logistic Multiple Regression Analysis of Predicting Self-Blood Pressure Monitoring (N=149)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient Estimate</th>
<th>OR Estimate</th>
<th>Wald Chi-square</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-.532</td>
<td>-</td>
<td>.451</td>
<td>.502</td>
</tr>
<tr>
<td>Stage of Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation</td>
<td>-</td>
<td>1.481</td>
<td>7.823</td>
<td>.020</td>
</tr>
<tr>
<td>Maintenance</td>
<td>-</td>
<td>5.699</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>-</td>
<td>.812</td>
<td>.672</td>
<td>.714</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>.448</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Pseudo $R^2$: 0.089

The next section will provide a discussion of this study’s overall findings.
CHAPTER 5
DISCUSSION

This correlational study was conducted to examine potential predictors of blood pressure control and self-blood pressure monitoring in municipal workers using stage of change for medication adherence, medication adherence self efficacy, and personal factors such as age, gender, education and marital status. The Transtheoretical Model of Change developed by Prochaska and DiClemente (1983, 1984) was used to guide this study. Descriptive statistics, ANOVA, chi square, and logistic regression analyses were utilized to analyze the data for the study. A discussion of the findings and conclusion will be presented in this chapter including nursing implications and recommendations.

Discussion of the Findings

Blood Pressure Control

The blood pressure control rate at 75.7% in this study population exceeded the goal of the Healthy People 2010, which was to decrease uncontrolled blood pressure rates to 50% or more (U. S. Department of Human Services, 2000). This finding was also consistent with the most recent trend in the United States (Egan et al., 2010). Furthermore, the blood pressure control rate for the current study also exceeded the prevalence of controlled blood pressure in a study conducted by Sinsuesatkul (2008) a couple of years earlier, who found the blood pressure control rate to be 51.9% in the same
population of workers. One potential reason for the high blood pressure control rate in the current study is that the study participants have access to insurance and participate in a workplace wellness program, which includes an annual health screening. In addition, these workers have the support of a workplace wellness staff which includes a nurse case manager, nurse coordinator, and a nutritionist.

Despite this access to health care and support, approximately one out of four participants (24.3%) had poorly controlled blood pressure. Suboptimal medication treatment may be a potential reason for uncontrolled blood pressures in this group. Findings indicated that only 5.6% of the study participants were on diuretics. The most recent national guidelines by the Joint National Committee (JNC7) recommend that the majority of patients with uncomplicated hypertension should be placed on a diuretic in combination with other antihypertensive medication, preferably in a combination pill, to adequately control blood pressures. Yet, only 38.9% of the study participants were on a combination pill for their blood pressures, and 61.1% were on only one medication pill.

Factors that predict blood pressure control in patients diagnosed with hypertension have not been well identified (Cushman et al., 2002). Few studies have examined the predictors of blood pressure control in workers with health care insurance (Sinsuesatkul, 2008). In the current study, the set of factors including stage of change for medication adherence, medication adherence, medication adherence self-efficacy, and self-blood pressure monitoring did not predict the probability of blood pressure control among hypertensive municipal workers who take antihypertensive medications. However, limitations of the current study, including the lack of variability in these variables as well as the sample size may have influenced the results.
Self-Blood Pressure Monitoring

Self-blood pressure monitoring is a more accurate blood pressure reading because it avoids white coat hypertension and blood pressure variability (Baguet & Mallion, 2002). In addition, findings from a previous meta-analysis have suggested that self-blood pressure monitoring may modestly improve blood pressure control and decrease the costs of hypertension treatment (Cappuccio et al., 2004). There was a high rate of self-blood pressure monitoring, particularly at home and the pharmacy in the current study.

Whereas other studies have reported that 50% of their participants used home blood pressure monitoring, the current study finding indicated that 70.5% of the participants self-monitored their blood pressure and 40% of the study participants monitored their blood pressures at home (Cuspidi et al., 2003; Knight et al, 2001). This high rate may be due to the popularity of home blood pressure monitoring and the availability of self-blood pressure monitoring in the community, especially its availability at the local pharmacist and Wal-Mart. In addition, it is possible that the Good Health Program 25 year history and resulting wellness culture may have influenced these participants to perform this monitoring. Another possibility is that participants of the Good Health Screen may have provided the socially desirable response, that is reported that they do monitor their blood pressures.

Self-Blood Pressure Monitoring and Blood Pressure Control

Self-blood pressure monitoring was not a predictor of blood pressure control in the current study. In addition, there was no significant association between self-blood
pressure monitoring and blood pressure control. These findings are contrary to previous studies which have primarily focused on the association of home blood pressure monitoring or telemonitoring and blood pressure control. The current study is one of the few studies conducted to date that has focused on self-blood pressure monitoring including home monitoring and blood pressure monitoring done in the community.

Green and colleagues (2008) designed an intervention study to examine the effectiveness of home blood pressure monitoring, web communication, and pharmacist care on blood pressure control over a year. Blood pressure control was not influenced by home blood pressure monitoring and web training alone. According to Green et al., improvement of blood pressure control was not seen until the web based pharmacist care was added. Similarly, blood pressure control has been achieved utilizing home blood pressure monitoring or telemonitoring in several studies that included nurse case managers and pharmacist support (Fahey et al., 2006; Zillich et al., 2005).

Also contrary to the current study results, a study conducted by Artinian et al. (2007) found a statistically significant reduction in systolic blood pressure monitoring in participants that utilized self-blood pressure monitoring in the form of telemonitoring over a 12 month period. Telemonitoring has been found to significantly decrease blood pressure in other previous studies as well (Friedman et al., 1996; Rogers et al., 2001). The current study did not examine the differences in self-monitoring equipment or approaches. A possible explanation for the discrepant findings is that a majority of participants in the current study used community based self-monitoring rather than home self-monitoring. The effect of location of self-monitoring on blood pressure control should be explored further.
Stage of Change, Self-Blood Pressure Monitoring, and BP Control

The stage of change instrument assesses the motivation of patients to take their medications (Julius, Novitsky & Dubin., 2009). Stage of change has not been commonly used in the study of blood pressure control in the United States. Krueger, Berger, and Felkey (2005) suggested that healthcare providers should assess readiness for change and explore barriers to change to be effective.

Stage of change was a significant predictor of self-blood pressure monitoring in the current study, but not blood pressure control. One potential reason for this may be that the stage of change variable is a behavior construct which may influence actions such as interventions and not outcomes such as blood pressure control. Overall, only 22.8 % of the current study participants were aware of the target blood pressure goal recommended by the national guidelines. Upon examining the participants by stage of change and self blood pressure monitoring, the majority of the participants in the maintenance stage of change (93.7%) utilized self-blood pressure monitoring. However, only 3.25% of the participants in the precontemplation and preparation stage employed self-blood pressure monitoring. The large percentage of the participants had been diagnosed with hypertension one year or less (36.2%) and 25.5% and 32.9 % were diagnosed with hypertension less than 5 years and more than 5 years respectively. Self-monitoring in the community is potentially promising without requiring each patient to purchase a blood pressure monitor of their own (McManus et al., 2005).

Stage of change for medication adherence did not predict blood pressure control in the current study sample of participants. Similar results were found in a study conducted by Powell (2003), in which the progression in the stage of change for
medication adherence was not related to blood pressure control. A potential reason for the lack of association found in the current study may be due to the complex wording of the four item self-reported stage of change instrument developed by Prochaska et al. (1992). If the participant gives a “yes” response to the first item of the questionnaire, it indicates the participant is in the maintenance stage of change. However, the second item asks the participants about their intent to adhere to their medications, which should be answered as a “yes” only if they are not in the maintenance stage. Many participants in the maintenance stage of change were confused by this and answered “yes” to item two. Difficulty classifying participants into a stage category was seen in a previous study conducted in Taiwan (Chang et al., 2003).

Another possible explanation for obtaining negative results may be that stage of change is a measure of behavior based on interventions, rather than on a behavior like blood pressure control which may involve many complex factors. Other possible reasons might be that the transitions between stages and the association between relapse and stage status are not captured by the stage of change instrument. Also, the negative results may be due to the fact that the majority of the participants in the current study were classified in the maintenance stage of change.

Medication Adherence

Medication adherence is a major factor in blood pressure control (Borzecki, Oliveria, & Berlowitz, 2005). Medication adherence was significantly associated with stage of change ($r = .347, p < .000$), medication adherence self-efficacy ($r = .549, p < .001$) and age ($r = .347, p < .001$) in the current study. Few studies, to the author’s
knowledge, have examined medication adherence self-efficacy and stage of change. Further, only one study was found that examined medication adherence and medication adherence self efficacy. Fernandez et al. (2008) findings suggested that medication self-efficacy is significantly associated with medication adherence (Fernandez et al., 2008). A major finding in this study is that the patient’s confidence to adhere to his blood pressure medication was positively associated with the age of the participant. Medication adherence was not significantly associated with self-blood pressure monitoring nor home blood pressure monitoring, which is contrary to previous studies (Chobanian et al., 2003). The average medication adherence score in the current study was 5.99 which indicated low medication adherence. This was inconsistent with a previous study which reported that the average medication adherence score was 6.6 indicating medium medication adherence (Morisky et al., 2008).

In addition, medication adherence did not predict blood pressure control. This is contrary to a previous research study that found a significant association among medication adherence and blood pressure control among African American men (Krousel-Wood et al., 2009). Moreover, the findings of Morisky et al. (2008) suggested a significant association between medication adherence and blood pressure control in hypertensive patients utilizing the Morisky Medication Adherence Scale used in the current study. A possible reason medication adherence was not associated with blood pressure control may be that the current study participants were a homogenous group lacking enough variability in medication adherence. Another plausible reason for these results might be that the participants gave sociable desirable answers on the medication adherence questionnaire.
Although the mean medication adherence score was in the moderate to upper range in the current study, approximately one-third (34.8%) of the participants with controlled blood pressure had low medication adherence, and 36.1% of the participants with uncontrolled blood pressure had low medication adherence. Other possible reasons for low medication adherence in the current study might be that the participants could not afford the medication copayments or because blood pressure is asymptomatic, some participants may not refill their medications. Also, although the participants were municipal workers with access to insurance, some might select to opt out of insurance, which may be a barrier to medication adherence and healthcare access.

It is important to note that 7% of the participants who were not included in the study had uncontrolled blood pressures and were not taking medications. It is unknown if these participants were followed by a primary care provider. In an occupational cohort, it may be necessary to ensure that all individuals have a primary care provider. In addition, it might be essential to explore barriers as to why hypertensive workers with uncontrolled blood pressures are not on antihypertensive medications. Previous researchers have identified key barriers to medication adherence such as lack of access to care, expense of medications, high copayments, and medications side effects and report that some patients simply forget to take their medications (American Society on Aging and American Society of Consultant Pharmacists Foundation, 2006; Osterberg & Blaschke, 2005; World Health Organization, 2003). In the current study, 27% of the participants reported forgetting to take their medication yesterday and 40.9% missed their medication in the last 2 weeks. These findings are important for development of targeted blood pressure control interventions
Medication adherence self-efficacy was not a significant predictor of self-blood pressure monitoring in the current study. The average medication adherence self-efficacy score in the current study was 3.47, which indicated medium medication adherence self-efficacy. This was consistent with a previous study that included 86% African American women (Fernandez et al., 2008), which had an average score of 3.62 at baseline and 3.72 at 3 months. Medication adherence self-efficacy was positively related to the duration of having hypertension, education and medication adherence in the current study, a major finding. Furthermore, no previous studies were found that explored medication self-efficacy with length of hypertension diagnosis and education. However, the instrument was initially tested where the majority of participants had a high school education or greater (Fernandez et al., 2008).

The current study findings suggested that medication adherence self-efficacy was also not a significant predictor of blood pressure control. These findings are incongruent with the results from previous studies, which found an association between medication adherence self-efficacy and blood pressure control among African Americans (Fernandez et al., 2008). A vast majority (92%) of the participants in the study conducted by Fernandez et al. were insured. Additionally, Ogedegbe and colleagues found an association between low income and medication adherence self-efficacy in African Americans (2003). Finally, Lennon, Hughes, Johnston, & McElnay (2001) conducted a study in an outpatient clinic in which a significant relationship was observed between self-efficacy scores and self reported medication adherence (p<0.005). A possible reason for the lack of medication adherence self-efficacy to predict blood pressure control in the
current study might be that there was a lack of variability in the medication self-efficacy scores. Almost half (47.8%) of the participants in the current study had high medication self-efficacy and 22.8% had medium medication adherence self-efficacy. Another potential reason for not finding a significant association among medication self-efficacy and blood pressure control is that the instrument lacked barriers such as medication costs and ability to obtain medication refill, perception of side effects, and chronic nature of hypertension. These barriers were removed from the MASE-R instrument upon its development and validation.

*Personal Factors and Blood Pressure Control*

In the current study, well educated African Americans had a high prevalence of controlled blood pressure. This finding is consistent with a previous study conducted by Svetkey et al. (1996), which indicated that well educated African Americans were likely to have controlled blood pressures. Although gender was independently related to the odds of blood pressure control in a previous study conducted with this study population, (Sinsuesatkul, 2008), in which females had a control rate that was double the control rate of males, the current study findings suggested that gender was not independently related to blood pressure control. Although not significant, females had a slightly lower blood pressure control rate (72%) than males (76%) in the current study. One possible explanation for the nonsignificant findings is the small proportion of females in the current study.

Contrary to previous study findings, age, gender, education, race, and marital status were not predictors of blood pressure control. The average age of the study
participants was 47 and the age group with the highest prevalence of uncontrolled blood pressure was 40-49 (41.7%). The second highest group of uncontrolled blood pressures was the 50-59 age group (33.3%). These finding were consistent with a previous study conducted by Sheats et al. (2005). However, older age was a significant predictor of blood pressure control in other previous studies (Knight et al., 2001; Hyman & Pavlik, 2001).

The Study’s Conceptual Model

This study utilized two key constructs from the Transtheoretical Model of Change (TMC): stage of change and self efficacy. Stage of change has been examined in a limited number of previous studies that aim to improve medication adherence (Willey et al. 2000). Patients vary in their readiness to adhere to an antihypertensive medication regimen, and interventions for improving medication adherence should be tailored to their stage of change (Willey et al., 2000). Although the current study findings do not suggest sufficient evidence for the use of the TMC because the entire theory was not applied to predict blood pressure control, the stage of change variable was found to be an independent predictor of self-blood pressure monitoring. In addition, there was a significant difference among the participants’ readiness for change and their medication taking behaviors. Furthermore, there was a difference in the participants’ stage of change and their confidence in their ability to take their antihypertensive medication as prescribed. A potential reason for the lack of the modified TMC to predict blood pressure control might be due to the nature of the instruments that measured stage of change and the homogenous sample. A two item instrument may be more sensitive in detecting the
stage of change instead of the Prochaska and colleagues’ four item instrument used in the current study. Assessing the stage of change may assist healthcare providers with selecting the appropriate interventions based on the readiness of the patient to help them improve medication adherence to obtain adequate blood pressure control.

The self-efficacy construct did not predict blood pressure control or self-blood pressure monitoring with this sample of participants. A possible reason for these findings is that the participants were mainly male, highly educated, African Americas with high self-reported medication adherence and self-efficacy. The participants were relatively homogeneous so that the predictors might not have been detected. Therefore, stage of change and self-efficacy may be predictors of blood pressure control and self-blood pressure monitoring in a more heterogeneous sample of participants. Nevertheless, there was a strong relationship between medication adherence self efficacy and medication adherence ($r = .549$, $p < .05$), which indicate that the MASE-R instrument was useful in this highly educated sample of majority African American men. These findings are similar to previous study in which the population was mainly African Americans but were majority unemployed, low income women (Fernandez et al., 2008).

Conclusions

Based on the findings of this study, conclusions were made as follows:

1) The vast majority of the study participants demonstrated controlled blood pressure and reported adherence to their antihypertensive medications at least 80% of the time.

2) A high proportion of the study participants reported self-blood pressure monitoring.
3) The prevalence of blood pressure control, medication adherence, and self-blood pressure monitoring were higher than rates reported in the general population.

4) Medication adherence self-efficacy was positively related to the duration of having hypertension, education and medication adherence.

5) The stage of change for the medication adherence variable was found to be a significant independent predictor of self-blood pressure monitoring. There was a significant correlation between stage of change and medication adherence and medication adherence self-efficacy.

6) A significant positive correlation was found between medication adherence and medication adherence self-efficacy.

7) Age was positively associated with medication adherence self-efficacy and with medication adherence.

8) Stage of change, medication adherence and medication adherence self-efficacy did not predict blood pressure control in this study.

Implications

Nursing Education Implications

Nursing students should be very familiar with the JNC 7 and the Transtheoretical Model of Change. Particularly, self-efficacy, stage of change, and processes of change should be taught in nursing programs. Occupational health nursing care plans that include medication adherence and self-monitoring of blood pressure may need to be standard for hypertensive employees. Creative interventions to influence the employees’ self-efficacy should be explored because medication adherence self-efficacy was found to be related to
medication adherence. The stage of change of an employee is significant in self-blood pressure monitoring as demonstrated by this study. Therefore, nursing programs should focus on teaching students how to assess stage of change as well as encourage and assist workers with their self-blood pressure monitoring and medication adherence.

Nursing Practice Implications

Blood pressure was uncontrolled in one-fourth of the workers who participated in this study despite having access to insurance and participating in an annual health maintenance program. Likewise, some had uncontrolled blood pressure despite being in the maintenance stage of change, having a self-report of high self efficacy, and a self-report of moderate to high medication adherence. This may indicate that other factors influence blood pressure control in this population.

A possible explanation for the lack of blood pressure control in this population may be the lack of optimal treatment as recommended by the JNC 7 guidelines. These guidelines recommend that individuals with hypertension may need at least two medications to control hypertension or they may need the use of a combination medication regimen. This may be taken into consideration when assessing patients’ medications and blood pressure control. The availability of inexpensive medication programs is readily available at the local drug store and health care providers may consider using these inexpensive drug lists when selecting prescription medications for their patients. The JNC 7 also recommends home blood pressure monitoring as a mechanism for individuals to utilize to obtain blood pressure control. Occupational health care providers might consider this as a routine intervention for many hypertensive
employees. The practitioner may consider assessing hypertensive individuals’ stage of change to determine the readiness for medication adherence, and provide interventions to move the employees to the maintenance stage of change.

**Implications for Nursing Research**

Although the participants of this study were insured and participated in an annual health maintenance program where they received medical support and referrals, 25% of the participants had uncontrolled blood pressure. Yet, these participants reported taking their antihypertensive medications. The findings from this study suggest that patients with hypertension that are not taking their antihypertensive medications may be experiencing barriers that are preventing them from taking their medications as prescribed. In this cohort, the barriers may be in the form of high copayments for prescriptions and doctor office visits.

Participants with uncontrolled blood pressures who self-report taking their antihypertensive medication might not be receiving optimal medication therapy prescribed by their health care provider to achieve control. A focus on the potential barriers experienced by the participants with uncontrolled hypertension, and the barriers experienced by health care providers who may provide suboptimal treatment need further study in this occupational cohort. In addition, the usefulness of self-blood pressure monitoring in other occupational groups should be examined as a way to improve blood pressure control.
Recommendations

This study assessed predictors of blood pressure control and self-blood pressure monitoring using the stage of change, medication adherence, medication adherence self-efficacy and personal factors (age, race, gender, and marital status). Based on the findings, conclusions, and implications, the recommendations are as follows:

1) A different instrument to measure stage of change is recommended to obtain more precise data related to the participant’s readiness to adhere to prescribed medication treatment rather than his/her intention of adherence.

2) A well-validated objective medication adherence measure is needed to verify the self-report scale to obtain more accurate data on medication adherence.

3) A different method to administer the self-report scales, such as a computer administered instrument, should be utilized in future studies.

4) Longitudinal studies are needed to examine the influence of medication adherence self-efficacy and self-blood pressure monitoring on medication adherence and blood pressure control.

5) The study variables (stage of change, medication adherence, medication adherence self-efficacy, and self-blood pressure monitoring) should be tested with other insured workers that are not participants of a worksite wellness program and with other job categories of workers.

6) Patient barriers to medication treatment should be examined in participants with uncontrolled blood pressure who are not taking antihypertensive medications.

7) Further studies are needed to examine physician prescribing practices to determine which variables influence a physician’s choice of treatment regimes for hypertension.
8) Future studies should examine blood pressure control and self-monitoring using a larger sample size and additional variables that are important in controlling blood pressure in this population.

9) Physiological variables should be explored such as sleep apnea and body mass index (BMI) as potential predictors of blood pressure control.

10) Researchers conducting future studies should examine the effect of location of self-monitoring on blood pressure control.
REFERENCES


https://scholarworks.iupui.edu/bitstream/handle/.../Gliem+&+Gliem.pdf?...1


managed care population. Disease Management and Health Outcomes, 15(4), 249-256.


APPENDIX A

INSTRUMENTS
BRFSS MODIFIED QUESTIONNAIRE

**Blood Pressure Frequency Questionnaire**
Complete this questionnaire if you are currently taking medicine for your high blood pressure. **Individuals have identified several issues regarding their medication-taking behavior and we are interested in your experiences. There is no right or wrong answer. Please answer each question based on your personal experience with the frequency of blood pressure monitoring.**

1). Are you measuring your blood pressure at home, at the drug store, at a friend’s house or in the community (firestation, community center, church, etc) to help monitor your blood pressure?
   _____ Yes   _____ No   _____ Don’t know / Not sure

2). Do you use a blood pressure monitor at home (to help monitor your blood pressure)?
   _____ Yes   _____ No   _____ Don’t know / Not sure

3). Do you check your own BP at any of the following places?
   Yes   No   Pharmacy (CVS, Walgreen’s, other)
   Yes   No   Walmart or other store
   Yes   No   Family member’s home
   Yes   No   Friend’s home
   Yes   No   Church
   Yes   No   Firestation
   Yes   No   Other, please specify where ________________

4). About how often do you check your blood pressure?
   _____ Most times Daily   _____ Yearly
   _____ Most times Weekly   _____ Never
   _____ Most times Monthly   _____ Don’t know / Not sure

5). About how many times in the past 12 months have you had your blood pressure measured by a doctor, nurse, or other health professional within your doctor’s office?
   _____ At least 5 or more times in the past year
   _____ 3 - 4 times in the past year
   _____ Once or twice in the past year
   _____ Have not had an office visit in the past 12 months
   _____ Don’t know / Not sure
6). How long have you had high blood pressure?
   ____ Less than 1 month
   ____ 1 – 3 months
   ____ 4 – 6 months
   ____ 7 – 12 months
   ____ Less than 5 years
   ____ More than 5 years
   ____ Don’t know / Not sure

7) How many pills do you take to control your blood pressure?
   ____ One pill
   ____ Two pills
   ____ Three or more

8) How many times a day do you take your blood pressure medication?
   ____ One time each day
   ____ Two or more times a day
   ____ Never
   ____ Don’t know / Not sure

9) What is your target blood pressure?
   ____ Don't know / Not sure
   ____ Less than 140/90 mm Hg
   ____ Less than 130/80 mm Hg
   ____ Some other value
STAGE OF CHANGE QUESTIONNAIRE

Please answer the following questions as honestly as possible by circling “Yes” or “No”. There is no wrong answer. This questionnaire may give you a clear idea of which stage you are in to better understand what steps to take to improve your blood pressure. All information provided will be kept confidential. “Taking my blood pressure medication as my doctor prescribed” is defined as taking the entire amount of blood pressure medication prescribed by your doctor at least 80% of the time.

1) I have been taking my blood pressure medication as my doctor prescribed for more than 6 months.
   
   Yes  
   No

2) I have been taking my blood pressure medication everyday at least 80% of the time in the last 6 weeks.
   
   Yes  
   No

3) I intend to take my blood pressure medication everyday at least 80% of the time or more in the next 30 days.
   
   Yes  
   No

1) I intend to take my blood pressure medication everyday as my doctor prescribed at least 80% of the time or more in the next 6 months.
   
   Yes  
   No
MORISKY MEDICATION ADHERENCE SCALE (MMAS)

You indicated that you are taking medication for your high blood pressure. Individuals have identified several issues regarding their medication-taking behavior and we are interested in your experiences. There is no right or wrong answer. Please answer each question based on your personal experience with your high blood pressure medication. Interviewers may self identify regarding difficulties they may experience concerning medication-taking behavior.

(Please circle the correct answer and number)

1. Do you sometimes forget to take your high blood pressure pills?
   No = 1       Yes = 0

2. People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your high blood pressure medicine?
   No = 1       Yes = 0

3. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?
   No = 1       Yes = 0

4. When you travel or leave home, do you sometimes forget to bring along your high blood pressure medication?
   No = 1       Yes = 0

5. Did you take your high blood pressure medicine yesterday?
   No = 1       Yes = 0

6. When you feel like your high blood pressure is under control, do you sometimes stop taking your medicine?
   No = 1       Yes = 0

7. Taking medication everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan?
   No = 1       Yes = 0

8. How often do you have difficulty remembering to take all your medications?

(Please circle the correct number)

Never/Rarely............................... 0
Once in a while............................ 1
Sometimes................................. 2
Usually............................... 3
All the time............................ 4
Medication Adherence Self-Efficacy Scale – Revised (MASES-R)

Situations come up that make it difficult for people to take their medications as prescribed by their doctors. Below is a list of such situations. We want to know your opinion about taking your blood pressure medication(s) under each of them. Please indicate your response by checking the box that most closely represents your opinion. There are no right or wrong answers. For each of the situations listed below, please rate how sure you are that you can take your blood pressure medications all of the time.

How confident are you that you can take your blood pressure medications:

<table>
<thead>
<tr>
<th></th>
<th>Not at all sure</th>
<th>A little sure</th>
<th>Fairly sure</th>
<th>Extremely sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When you are busy at home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>When there is no one to remind you</td>
<td></td>
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<tr>
<td>3</td>
<td>When you worry about taking them for the rest of your life</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>When you do not have any symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>When you are with family members</td>
<td></td>
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<tr>
<td>6</td>
<td>When you are in a public place</td>
<td></td>
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<tr>
<td>7</td>
<td>When the time to take them is between your meals</td>
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<td></td>
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<tr>
<td>8</td>
<td>When you are traveling</td>
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<td>9</td>
<td>When you take them more than once a day</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td>When you have other medications to take</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>When you feel well</td>
<td></td>
<td></td>
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<tr>
<td>12</td>
<td>If they make you want to urinate while away from home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Please rate how sure you are that you can carry out the following task:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Make taking your medications part of your routine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GOOD HEALTH PROGRAM QUESTIONNAIRE

INSTRUCTIONS: Please complete the questions below.

1. How long have you been working for the City of Birmingham?
   __________ Year(s) _________ Month(s)

2. What is your age today (in years)? _________

3. Sex [ ] Male [ ] Female

4. What is the highest grade you completed in school?
   [ ] Grade School or less [ ] Some college
   [ ] Some high school [ ] College Graduate
   [ ] High school graduate [ ] Post Graduate Degree

5. What is your race?
   [ ] Aleutian, Alaska Native, Eskimo, or American Indian [ ] White
   [ ] Asian [ ] Other
   [ ] Black [ ] Don’t Know
   [ ] Pacific Islander

6. Are you of Hispanic origin, such as Mexican-American, Puerto Rican, or Cuban?
   [ ] Yes [ ] No

7. Are you currently?
   [ ] Married [ ] Never married [ ] Divorced [ ] Separated [ ] Widowed

8. Have you ever been told that you have hypertension [Yes] [No]
   How many years ago?____

9. Have you ever been told that you have diabetes [Yes] [No]
   How many years ago?____

10. Systolic BP ____ Diastolic BP ______

11. Taking antihypertensive? [Yes] [No]
   Number of antihypertensive medications _____ Class ____________________

12. Taking medication for diabetes? [Yes] [No]

13. Have any of your grandparents, parents, brothers or sisters had high blood pressure?
    [Yes] [No]

THANK YOU VERY MUCH
APPENDIX B

INSTRUMENT APPROVAL
Greetings Tonya and I have attached an updated scoring sheet for your information. We have always used a 75% completion criteria for establishing eligibility. Best of success on your proposal defense.

dmorisky

At 10:28 AM 8/4/2009, you wrote:

Dear Dr. Morisky:
Thanks so much for all the information you have provided me concerning the Morisky Medication Adherence Scale (MMAS)! I am preparing my proposal defense, and need information regarding how to handle missing data when using the Morisky Medication Adherence Scale (MMAS). Please advise...
Thanks!
Tonya

Tonya Breaux-Shropshire, PhD (c)
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205-989-1639 (h)

Mailing Address:
5622 Summer Place Parkway
Hoover, AL 35244
From: Donald E. Morisky [dmorisky@ucla.edu]
Sent: Monday, December 08, 2008 1:54 PM
To: Tonya B Shropshire
Subject: Re: 8-item Medication Adherence Scale

Thank you Ms. Breaux-Shropshire for your interest in the Morisky Medication Adherence Scale (MMAS) which was recently published in the Journal of Clinical Hypertension. I give you permission to use this copyrighted scale and will waive any licensure fee, provided that you agree to use journal citations in your research results and provide me with the results of your research findings. I have attached a file identifying the coding instruction of the 8-item instrument...

Best of success in your dissertation research...

Dmorisky

Donald E. Morisky, Sc.D., M.S.P.H., Sc.M.
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26-070 CHS
Los Angeles, CA 90095-1772

e-mail: dmorisky@ucla.edu
Phone: (310) 825-8508
Fax: (310) 794-1805
Dear Dr. Morisky:

I am writing to request permission to use the 8-item Medication Adherence Scale in my dissertation research at the University of Alabama at Birmingham. I learned about the Medication Adherence Scale in your article titled "Predictive validity of a medication adherence measure in an outpatient setting? and several other articles found in a recent Pub Med search. I think that this instrument would be a good fit for my research on blood pressure control.

Sincerely,

Tonya Breaux-Shropshire, MPH, RN, BSN, COHC
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******************************************************************************
Dear Dr. Fernandez:

I am writing to request permission to use the MASES-R in my dissertation research. I read about the instrument in the article titled “Revision and validation of the medication adherence self-efficacy scale (MASES) in hypertensive African Americans”. I think the MASES-R is a good fit for my research concerning medication adherence in African Americans. Please let me know if you need more information. I look forward to hearing from you.

Sincerely,

Tonya Breaux-Shropshire, MPH, RN, BSN, COHC
University of Alabama at Birmingham
School of Nursing
Promoting, Protecting and Restoring Health
PhD Student
104 Churchill Lane
Dothan, Alabama 36305
tshropshire@uab.edu
504-756-1715 (c)
205-989-1639 (h)

Mailing Address:
5622 Summer Place Parkway
Hoover, AL 35244

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******************************************************************************
From: Tonya B Shropshire  
Sent: Monday, May 04, 2009 10:44 AM  
To: Fernandez, Senaida  
Cc: aschoenthaler@gmail.com  
Subject: RE: FW: Medication Adherence Self-Efficacy Scale (MASES)  

Hi Senaida,  

It is good to hear from you. I really appreciate your help. Thanks so much!!  

Regards,  
Tonya

From: Fernandez, Senaida [Senaida.Fernandez@nyumc.org]  
Sent: Monday, May 04, 2009 10:37 AM  
To: Tonya B Shropshire  
Cc: Schoenthaler, Antoinette  
Subject: RE: FW: Medication Adherence Self-Efficacy Scale (MASES)  

Hi Tonya,  

Attached please find the MASES-R. The instrument is the in the appendix (page 460) of the attached article. Best of luck with your dissertation!  

Best regards,  
Senaida
Hi Tonya

I am glad to hear you are close to completing your dissertation. Congratulations! You certainly have permission to use the revised MASES. My colleague Senaida Fernandez will send it to you on Monday.

Best
Antoinette

On Fri, May 1, 2009 at 1:39 PM, Tonya B Shropshire <george37@uab.edu> wrote:
> Dear Ms. Schoenthaler:
>>
> Thanks again for your help in April of last year regarding the MASE scale
> (please see below). While browsing the literature, before submitting the IRB
> for my dissertation, I notice that there is a revised MASE (MASE-R) created
> by Dr. Ogedegbe and colleagues. How can I get permission to use the revised
> version?
>>
> Sincerely,
> Tonya
> ______________________________
From: Tonya B Shropshire
Sent: Wednesday, April 02, 2008 10:50 AM
To: Antoinette Schoenthaler
Subject: RE: Medication Adherence Self-Efficacy Scale (MASES)

Okay, thanks so much Antoinette! I will fill it in...

Tonya Breaux-Shropshire, MPH, RN, BSN, COHC
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School of Nursing
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104 Churchill Lane
Dothan, AL 36305
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504-756-1715 (c)
334-671-2994 (h)

From: Antoinette Schoenthaler
[mailto:aschoenthaler@gmail.com]
Sent: Wed 4/2/2008 9:12 AM
To: Tonya B Shropshire
Subject: Re: Medication Adherence Self-Efficacy Scale (MASES)

Yup, it should read if they sometimes make you feel dizzy.

On 4/2/08, Tonya B Shropshire <george37@uab.edu> wrote:

Okay, see attachment for the copy. Please let me know as soon as possible. Thanks so much.

Tonya Breaux-Shropshire, MPH, RN, BSN, COHC
University of Alabama at Birmingham
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PhD Student
104 Churchill Lane
Dothan, AL 36305
tshropshire@uab.edu
504-756-1715 (c)
334-671-2994 (h)
Hi Tonya,

Yes there is--I apologize, I thought I sent you the updated version. Unfortunately, I don't have a copy of the measure with me because we just changed institutions but I am positive that question 17 should read "if they make you feel dizzy"

If you would like send me the copy I sent you and I can double check.

Antoinette
From: Antoinette Schoenthaler [mailto:ams2125@columbia.edu]
>>> Sent: Thu 2/14/2008 3:11 PM
>>> To: goo1@columbia.edu
>>> Cc: Tonya B Shropshire
>>> Subject: Re: Medication Adherence Self-Efficacy Scale (MASES)

Hello Tonya

Please find the MASES scale attached. Please feel free to email me about any additional questions you may have.

Good luck with your dissertation,

Antoinette

goo1@columbia.edu wrote:
>>> > I am ccing my colleague Dr. Schoenthaler, she will forward it to you.
>>> > Best.
>>> >
>>> > Quoting Tonya B Shropshire <george37@uab.edu>:
>>> >
>>> >> Absolutely, thanks so much. Where can I access the instrument?
>>> >>
>>> >> Tonya Breaux-Shropshire, MPH, RN, BSN, COHC
>>> >> University of Alabama at Birmingham
>>> >> School of Nursing
>>> >> PhD Student
>>> >> 104 Churchill Lane
>>> >> Dothan, AL 36305
>>> >> tshropshire@uab.edu
>>> >> 504-756-1715 (c)
>>> >> 334-671-2994 (h)


From: Tonya B Shropshire  
Sent: Sunday, January 04, 2009 6:07 PM  
To: Carlo DiClemente  
Cc: jop@uri.edu  
Subject: RE: Requesting permission to use the 4 Stages of Change Statements for UAB dissertation

Thanks so much for your permission and your comments Dr. DiClemente!

Tonya  
Tonya Breaux-Shropshire, MPH, RN, BSN, COHC  
University of Alabama at Birmingham  
School of Nursing  
Promoting, Protecting and Restoring Health  
PhD Student  
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******************************************************************************
That goes for me as well. I also agree that a behavioral standard of what constitutes action is critical.
You have my permission, Tonya. Thanks for asking.

Many researchers tailor the questions to their particular study. I would suggest that you set a behavioral criteria (e.g., 95% or more) in place of "without fail"

Best of success with your project
John Norcross

John C. Norcross, Ph.D., ABPP
Professor of Psychology & Distinguished University Fellow
Editor, Journal of Clinical Psychology: In Session
University of Scranton, Scranton, PA 18510-4596
Voice: 570-941-7638 Fax: 570-941-7899
Email: norcross@scranton.edu
http://academic.scranton.edu/faculty/norcross/
Tonya B Shropshire wrote:

Dear Drs. Prochaska, Norcross, and Diclemente:

I am writing to request permission to use the 4 Stages of Change statements that you refer to in the book titled *Changing for Good: A Revolutionary Six-Stage Program for Overcoming Bad Habits and Moving Your Life Positively Forward*. I would like to use the following statements in my dissertation research at the University of Alabama at Birmingham:

1) *I have solved my problem more than 6 months ago.*
   
   Yes  
   No

2) *I have taken action in the last 6 weeks.*
   
   Yes  
   No

3) *I am intending to take action in the next month.*
   
   Yes  
   No

4) *I am intending to take action in the next 6 months.*
   
   Yes  
   No

I think this instrument would be a good fit for my research on blood pressure control. Because I will be using the statements with hypertensive patients, I would like to be specific in the statements. Is it okay to alter the statements to specify the problem as "poor blood pressure medication adherence" in statement 1 and the action as "take my blood pressure medication everyday without fail" in the other 3 questions? I look forward to hearing from you.

Sincerely,

Tonya Breaux-Shropshire, MPH, RN, BSN, COHC
University of Alabama at Birmingham
School of Nursing
Promoting, Protecting and Restoring Health
PhD Student
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Dothan, Alabama 36305
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Mailing Address:
5622 Summer Place Parkway
Hoover, AL 35244
APPENDIX C

GOOD HEALTH PROGRAM APPROVAL
From: Perley, Joni B.  
Sent: Monday, September 14, 2009 1:39 PM  
To: 'Kathleen C Brown'  
Cc: Thomas Kekes-Szabo  
Subject: RE: Blood Pressure Questionnaire  
Importance: High

Kathy: This will confirm the City’s approval for the Blood Pressure Monitoring Study by Tonya Breaux-Shropshire at the upcoming fall 2009 medical screen and through the calendar year 2010.

Please let me know if you need further information regarding the City’s consent. We would certainly be interested in the results of her study when completed and how what is learned can benefit the Good Health Program.

Thank you.

Joni B. Perley  
Benefits Administrator  
City of Birmingham Office of Personnel  
710 North 20th Street Suite 800  
Birmingham AL 35203  
Office: 205 254-2796  
FAX: 205 254-2415
APPENDIX D

INSTITUTIONAL REVIEW BOARD APPROVAL
Form 4: IRB Approval Form
Identification and Certification of Research Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA0000560 and it expires on January 31, 2012. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56 and ICH GCP Guidelines.

Principal Investigator: SHIROPShIRE, TONYA B.
Co-Investigator(s):
Protocol Number: X09824088
Protocol Title: Self-Blood Pressure Monitoring, Stage of Change, Medication Adherence, Self-Efficacy, and Blood Pressure Control in Hypertensive Workers

The IRB reviewed and approved the above named project on 9/16/09. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This project will be subject to Annual continuing review as provided in that Assurance.

This project received EXPEDITED review.
IRB Approval Date: 9/16/09
Date IRB Approval issued: 9/16/09

Marilyn Doss, M.A.
Vice Chair of the Institutional Review Board for Human Use (IRB)

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.
UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The assurance number is FWA0000590 and it expires on October 26, 2016. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56 and ICH GCP Guidelines.

Principal Investigator: SHROPSHIRE, TONYA B.

Co-Investigator(s):

Protocol Number: X090824008

Protocol Title: Self-Blood Pressure Monitoring, Stage of Change, Medication Adherence, Self-Efficacy, and Blood Pressure Control in Hypertensive Workers

The IRB reviewed and approved the above named project on 7-28-10. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This Project will be subject to Annual continuing review as provided in that Assurance.

This project received EXPEDITED review.

IRB Approval Date: 7-23-10

Date IRB Approval Issued: 7-28-10

Marilyn Doss, M.A.
Vice Chair of the Institutional Review Board for Human Use (IRB)

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.