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Factors Affecting Blood Pressure Target Outcomes for Veterans Using Home Telehealth

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FACTORS AFFECTING BLOOD PRESSURE TARGET OUTCOMES FOR VETERANS
USING HOME TELEHEALTH

by

Vincent John Boom

A Dissertation Submitted in
Partial Fulfillment of the
Requirements for the Degree of

Doctor of Philosophy

in Nursing

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May 2020

ABSTRACT

FACTORS AFFECTING BLOOD PRESSURE TARGET OUTCOMES FOR VETERANS USING HOME TELEHEALTH

by

Vincent John Boom

The University of Wisconsin-Milwaukee, 2020
Under the Supervision of Professor Rachel Schiffman

Hypertension is the most common diagnosis among Veterans, contributing to approximately 15,000 veterans hospitalized for stroke every year. The high prevalence of hypertension found in the Veteran population suggests a need to better define the risks and benefits associated with the diagnosis and treatment of hypertension. The U. S. Department of Veteran Affairs (VA) home telehealth program provides chronic care management for hypertension to facilitate Veteran access to care. Existing evidence suggests Veterans' monitoring of blood pressure at home may selectively assist in managing hypertension. This secondary analysis of data used a self-management lens to assign meaning to traditionally demographic variables from a primary study. The purpose of this study was to explore whether the risk and protective factors of age, ethnicity/race, marital status, living arrangement, number of diagnosed chronic illnesses, and number of instrumental activities of daily living impairments, along with the self-management behavior home telehealth utilization rate, contribute to predicting success in maintaining blood pressure targets by Veterans who are participating in home telehealth services to manage hypertension. The sample was 107 Veterans with a mean age of 73.97, years with few participants below the age of 60. The majority of participants were married and living with their spouse or in a living arrangement with others. Most participants

were white. Results from this study indicated that success in both outcomes home telehealth utilization rate and maintaining blood pressure targets were partially predicted by age. Age and number of chronic conditions explained 15% of the variance with home telehealth utilization rate and explained 14.4% of the variance with maintaining blood pressure targets. Results also indicated that the outcomes home telehealth utilization and maintaining blood pressure targets were not related; therefore, home telehealth utilization rate was most likely not a mediator between age and maintaining blood pressure targets. Tailored interventions based on age and chronic conditions may impact outcomes for Veterans self-managing blood pressure through VA home telehealth services.

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DEDICATION

To

My guiding light and wife Mia, as this would have never happened without her generous love, help and support,

My four sons Pierce, Avery, Foster, and Keane – they are the best parts of me, and I am incomplete without them,

Grand Master Son Young Gul, I am no longer a “Fighter in the Wind”,

Dan Cohen and Rachel Newsham – the world’s best coaches in my corner, pushing, “Stay with the fight!”

The Veterans and Warriors of the United States Armed Forces, for without their sacrifices we would not be embracing our freedoms and liberties today.

May they be safe. May they be happy. May they be healthy. May they live easy.

Kia ora!
Kia kaha!

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LIST OF ABBREVIATIONS

BP – Blood Pressure

HTN - Hypertension

HCP – Health Care Provider

IADL – Instrumental Activities of Daily Living

IFSMT – Individual and Family Self-Management Theory

IOM – Institute of Medicine

NIH – National Institutes of Health

PCPO – Primary Care Program Office

RNAO – Registered Nurses’ Association of Ontario

SM – Self-Management

VA – Veterans Affairs

VA/DoD – Veterans Affairs/Department of Defense

VHA – Veterans Health Administration

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CHAPTER 1

Statement of the Problem

Hypertension is the most common diagnosis among Veterans, contributing to approximately 15,000 veterans hospitalized for stroke every year, costing an estimated \$111 million (U. S. Department of Veterans Administration/U. S. Department of Defense [VA/DoD, 2020]). The U.S. Department of Veterans Affairs (VA) is working to enhance stroke care through improving care management, focusing on prevention strategies, and expanding patient and system-level data (VA, 2010). The goal of the department is to improve blood pressure control to prevent strokes among Veterans (VA/DoD, 2014). Of the nearly 6 million Veterans seen by Veterans Health Administration (VHA) primary care in 2011, the prevalence of hypertension was 52.3% (Kinsinger, 2015).

The high prevalence of hypertension found in the Veteran population suggests a need to better define the risks and benefits associated with the diagnosis and treatment of hypertension. Only by working together can Veterans and their providers address the chronic illness of hypertension. For both provider and patient, military participation is an often-overlooked early-adulthood experience that has potential to shape a range of later-life health and health-related outcomes (London & Wilmoth, 2006). During the past 25 years, a growing body of research has shown that the U.S. military is a large, critical social institution that can reshape educational, occupational, income, marital/family, health, and other life course decisions and outcomes (MacLean & Elder, 2007; Settersten, 2006). The potential of the military to transform lives varies across individual characteristics, the timing of military service during the course of life, and individual service experiences (Teachman, 2004).

There exists substantial literature on the physical health of Veterans suggesting they are historically in poorer health and have more functional limitations and disabilities than non-Veterans (Schnurr, Spiro, & Paris, 2000; Wilmoth, London, & Parker, 2012). Although this literature does provide important data on the health of Veterans, it often does not directly examine health differences between Veterans and non-Veterans, compare officers to enlisted military members, analyze Veterans with and without combat experience, or attempt to determine the extent to which military service during particular wars may have different effects on health later in life (Wilmoth et al., 2012).

Veterans Health Administration Home Telehealth Services

Veterans need to understand what hypertension means to them and know how to best manage it. To address the issue, in 2010 the VA undertook a series of transformational initiatives to “design a Veteran-centric healthcare model and infrastructure to help Veterans navigate the healthcare delivery system and receive coordinated care” (VA, 2010). As part of this effort, the VA supports the use of technology in conjunction with virtual medicine and is implementing a patient-centered medical home model at all VA primary care locations; this is referred to as Patient Aligned Care Teams (Primary Care Program Office [PCPO], 2016). The most recent information available shows that Patient Aligned Care Teams continues to manage by collaboration between primary care providers with other clinical and non-clinical VA staff and has “. . . tremendous potential to reshape the healthcare experiences of the millions of Veterans currently enrolled in the VA healthcare system” (PCPO, 2016).

Home telehealth is an example of virtual medicine technology; it involves the use of communications technology to deliver health services in situations where the care recipient is separated by distance from the care provider (Hogan, Wakefield, Nazi, Houston, & Weaver

2011). Supported by the VA Office of Telehealth Services, the home telehealth program provides chronic care management, such as for hypertension, to facilitate Veteran access to care and support Veteran self-management in the least restrictive environment possible, which is the Veterans' own homes (VA, 2010; PCPO, 2010). Messaging devices link Veterans with care coordinators. Messaging devices in the Veteran's home are programmed with a set of questions (referred to as disease management protocols), to which the Veteran responds by pressing buttons. The responses prompt the care coordinator to deliver potential interventions and/or education, consult with members of the care team, or telephone the Veteran for further assessment or instructions. Peripheral devices, such as blood pressure cuffs, can also connect to the messaging device for easy, often Veteran-initiated, data downloading and transmission (Hogan et al., 2011).

Participating in the VA's home telehealth program for hypertension is voluntary for Veterans as they learn to control their hypertension and enter a maintenance phase of therapy. Once Veterans are successfully and confidently maintaining blood pressure targets, they are encouraged to leave the home telehealth program. Unlike their civilian counterparts, the Veterans using VA home telehealth are not prescribed telehealth for only a short amount of time but are allowed to use the program until they confidently self-manage.

Veterans' monitoring of blood pressure at home may selectively assist in managing hypertension (VA/DoD, 2020). Studies indicate that self-monitoring may help in differentiating white-coat hypertension (i.e., persistently elevated office blood pressure [BP] with normotensive BP by home or ambulatory BP readings) from chronically high BP readings. Self-monitoring may also provide additional readings in patients who are already being treated for hypertension but who also have a white-coat component (VA/DoD, 2020). There is also some evidence to

suggest that home BP monitoring has good prognostic efficacy for predicting cardiovascular events (Coll-de-Tuero et al., 2012).

Defining Self-Management

At a broad level, self-management is defined as the day-to-day management of chronic conditions by individuals over the course of an illness (Grady & Gough, 2014; Lorig & Hollman, 2003). In totality, self-management has been described and considered for more than 40 years, with the term originally coined by Thomas Creer to suggest that patients are active participants in their own treatments (Grady & Gough, 2014). The purpose of Creer and his colleagues using the term “self-management” was important in that it allowed for the patient to become an important, decision-making member of the health care team (Grady & Gough, 2014). Today the term self-management is used quite broadly and is described with an array of definitions and conceptualizations, which only contributes to further a lack of clarity and agreement in the literature (Ryan & Sawin, 2009). For the purposes of the current study, self-management is best described as a multidimensional and complex phenomenon that can be conceptualized as affecting individuals, dyads, or families across all developmental stages (Ryan & Sawin, 2009).

Theories of self-management incorporate risk and protective factors for a health condition, a process that demonstrates how the individual is making decisions about managing the condition, and the outcomes of those decisions. One such theory, the Individual and Family Self-Management Theory (IFSMT), is a biopsychosocial model that assumes that health behavior changes are dynamic (Ryan & Sawin, 2009). Within the IFSMT, explorations of self-management can consider as risk and protective factors both components of the physical and social environment and the unique characteristics of individuals and family members (Ryan & Sawin, 2009). The IFSMT addresses: (1) the **context** of self-management, made of risk and

protective factors, which can differentiate between acute and chronic illness; (2) the **process** of self-management, which can address specifics of activities, such as self-regulation skills, knowledge, and beliefs; and (3) the **outcomes** of self-management, which can be determined using condition-specific measures (Ryan & Sawin, 2009).

Self-management theories, such as the IFSMT, have the potential to elucidate how health decisions are made by Veterans self-managing hypertension through home telehealth services. There are data in this current study to examine potential relationships between risk and protective factors and clinical outcomes. However, no process factors were available in the data for this current study, which is a vital component of the IFSMT. Without process factors, it becomes difficult to elucidate personal decisions being made.

However, potential relationships were explored between risk and protective factors and outcomes, since risk and protective factors play a significant role in the decision-making process. Therefore, it would be inappropriate to use a devoted self-management theory as a research framework. The IFSMT would be better utilized as a means to organize and define personal risk and protective factors. The IFSMT does provide for proximal outcomes to be used as mediators in relationships (Ryan & Sawin, 2009). Since the home telehealth utilization rate can be used as a distal outcome, it is reasonable to consider it a possible relationship mediator between risk and protective factors and outcomes.

Risk and Protective Factors. According to Ryan and Sawin (2009), risk and protective factors include condition specific factors, physical and social environments, and individual and family characteristics (Ryan & Sawin, 2009). The current study used what are traditionally considered demographic characteristics as self-management (SM) risk and protective factors. A Veteran's age, race/ethnicity, marital status, living arrangement, number of impairments to

instrumental activities of daily living (IADL), and number of diagnosed chronic conditions may inform health decision-making for those who self-manage hypertension through home telehealth. Using a self-management lens assigns meaning to the individual personal characteristics of the Veterans.

Self-Management Behavior. The current study included how frequently the Veteran uses home telehealth services, referred to as the home telehealth utilization rate, as the self-management behavior. Currently the VA home telehealth guidance is written for all Veterans enrolled in home telehealth services for hypertension to have a 100%, or daily, Veteran-initiated blood pressure monitor utilization, with a variance of down to 70%, as the call center is staffed only five days per week (VHA Telehealth Services, 2012). The home telehealth utilization rate is entirely a Veteran-initiated data transmission from taking blood pressures at home, demonstrating an action made by the Veteran.

Clinical Outcome. The clinical outcome was blood pressure target maintenance or keeping BP measures within acceptable limits. Conceptually this factor includes different anticipated results for Veterans who are of an advanced age, and/or dealing with the comorbidity diabetes. It has already been seen that blood pressure tends to increase with advanced age and when dealing with diabetes, mainly because of kidney function.

The flow of self-management for Veterans who are self-managing HTN through VA home telehealth services is depicted in Figure 1.

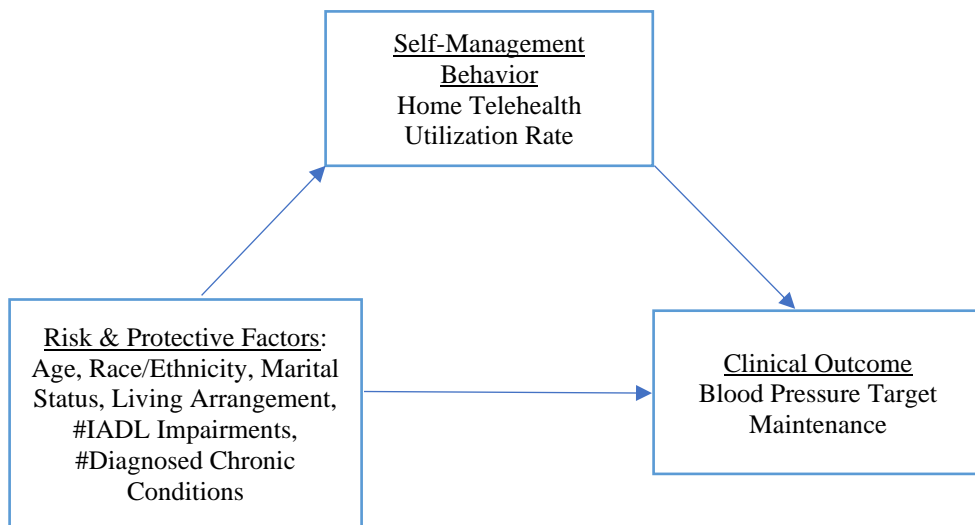


Figure 1
Framework for factors affecting blood pressure target outcomes for Veterans using home telehealth

Application of Study to Model and Definitions of Terms

Condition-specific risk and protective factors. Condition-specific factors are those physiological, structural, or functional characteristics of the condition, its treatment, or prevention of the condition that impact the amount, type, and nature of behaviors needed for hypertension SM (Ryan & Sawin, 2009). According to Ryan and Sawin (2009), the risk and protective factors can be comprised of the complexity of condition, physical or social environment factors, and individual and family factors.

Complexity of condition. Hypertension is usually seen as the product of physiologic abnormalities within the arteries, generally believed to be related to health behaviors and possible genetic predisposition (VA/DoD, 2014). It should be noted that hypertension is seen as a difficult-to-manage chronic condition, because gaining control of blood pressure requires individual choices to be made regarding exercise, diet, taking medication, and personal attitudes.

Despite years of research on how to control hypertension, complications and associated deaths continue to occur in large numbers.

As an example, hypertension contributes to cardiovascular, renal, visual, and neurological complications (National Institutes of Health, 2004). Deaths in the United States from stroke, a major complication of hypertension, occur approximately one every 40 seconds (Roger et al., 2012). It is estimated that every year 795,000 Americans have a stroke, and it is predicted there will be another 4 million by 2030 (Roger et al., 2012). Hypertension management and care is best delivered when taking into account a patient's needs and preferences. Providers need to integrate good communication between the Veteran and themselves. Choices should be supported by evidence-based information tailored to the Veteran's needs (VA/DoD, 2014).

Physical or social environment risk and protective factors. Physical or social environment factors include access to health care, transition in health care provider or setting, transportation, neighborhoods, schools, work, culture, and social capital that enhance or present barriers to individual and family SM. Ethnicity/race is considered a physical or social environment factor because it is cultural.

Ethnicity/race (Black, White, Hispanic/Latino, Native American, Asian American, Other). Race refers to a person's physical appearance, such as skin color, eye color, and hair color. Race is often used to divide people into groups based on physical characteristics and presumed biological differences. Ethnicity is a person's group and cultural traits, such as nationality, ancestry, language, and beliefs (Sue & Dhinsda, 2006). These facts do not make the meaning of this factor any different for Veterans, as they come from many different cultural backgrounds.

Some ethnic minority groups have shown to have higher rates of hypertension. For example, African Americans living in the United States suffer from disproportionately higher rates of hypertension than whites, and the reasons for this disparity remain poorly understood. In addition to perceived socioeconomic differences, exposure to racial discrimination has been proposed as a contributing factor (Spruill, 2010). Evidence of race differences highlights the importance of identifying the types of stressors that are most harmful for various groups, as well as factors that may exacerbate or buffer the effects of stress.

Other ethnic minority groups have shown to have lower rates of hypertension, such as non-Hispanic Asian. It is possible that these people may also suffer from experiencing racism but utilize different coping mechanisms to relieve stress.

Individual risk and protective factors. These are the characteristics of the individual that enhance or diminish SM, for example: individual cognitive status, perspectives, information processing, developmental stages, individual and family capabilities and cohesion, literacy, and resourcefulness.

Age in years. All Veterans have a similar background in that they were all military members at one time; however, what that means to them individually depends on their life experiences before and after military duty. It stands to reason that hypertension would have different meaning and life impact on Veterans as they age. As a growing body of research attests to, risks for declines in health and functioning at older ages are influenced by lifestyle characteristics, including differences in levels of physical activity, as well as levels of social engagement and psychological characteristics. According to the IFSMT, age can also contribute to developmental level, affecting problem-solving abilities (Ryan & Sawin, 2009).

Age-related BP elevations derive from changes in the arterial structure and function accompanying aging. The elasticity of the large vessels decreases due to the alteration of various collagen components in the vessel wall (Oliva & Bakris, 2012). These changes cause increases in pulse wave velocity, leading to late systolic BP augmentation and increasing myocardial oxygen demand. Reduction of forward flow also occurs, limiting organ perfusion. The arterial stiffness is manifested clinically by the widening of pulse pressure, which is seen commonly in the elderly patients (Oliva & Bakris, 2012). Data from the Framingham Heart Study suggest that systolic BP continues to increase, whereas diastolic BP decreases, resulting in widened pulse pressure after 50 years of age (Franklin, Khan, Wong, Larson, & Levy, 1999). To summarize, age contributes to declines in health and organ functioning, reduced mobility, weakened immune system, and greater risk from physical injury. However, a major protective component of aging is wisdom gained from life experience, which potentially leads to better health decisions and better quality of life.

Family structure and functioning risk and protective factors.

Marital status (married, widowed, divorced/separated, never married). A relationship exists between marital status and quality of life as related to hypertension risk and protection (Han, Park, Kim, Kim, & Park, 2014). Studies within demographic research have highlighted that health and mortality outcomes for married persons are better than for unmarried persons (Liu, 2012). Research has sought to explore the extent of “marriage selection” by which healthier persons are selected into marital unions, while less healthy individuals either remain single or are more likely to become separated, divorced, or widowed (Rendall, Weden, & Favreault, 2011). Research has also demonstrated that marriage provides protection against adverse health

outcomes, through modified health behaviors and social networks arising from the union (Han et al., 2014).

Marriage has potential to add risk as well, as sometimes marriage is not all positive. Blood pressure trends can increase from possible stressful interactions, as partners are seldom equal risk-takers (Han et al., 2014). Cash flow and bill paying are part of the economics of marriage requiring different levels of risk-taking. One person may be a money saver while the other is a money spender. One partner may become sick and unable to work. There is also potential stress from remaining with an incompatible person (Han et al., 2014).

Recent changes in divorce patterns at middle and older ages are likely to lead to an increasing diversification of living arrangements at older ages (Robards et al., 2012). Given this, cross-sectional indicators of current marital status are likely to become of less conceptual use as different individuals with the same current marital status may have experienced very different trajectories in reaching that state, with some being in the same union throughout their lives while others may have experienced multiple partnership formation and dissolution (Robards et al., 2012).

Living arrangement (lives alone, lives with spouse, lives with other adult, lives with dependent child, lives in assisted living, lives in long term care or skilled nursing facility). It has been found in prior studies that elderly persons living with a spouse are more likely than those living alone to obtain preventive care services (Lau & Kirby, 2009). Veterans living alone, with a spouse, or with other adults may exhibit different strategies for using home telehealth in managing hypertension. Given increasing cohabitation and rising divorce at older ages, the consideration of cohabitation at older ages is an important contribution to the literature. Lund et al. studied mortality in relation to cohabitation, living with or without a partner, and marital

status; they demonstrated that in Denmark, there is high and significantly increased mortality for persons living alone. Compared with marital status, cohabitation status was a stronger predictor of mortality, and no age or gender differences were identified (Lund et al., 2002). Understanding the relationship between living arrangements and health across the life course may therefore be of increasing importance.

Demands of SM risk and protective factors

Historically poor HTN control has been attributed to provider factors, such as clinical inertia in prescribing adequate medications or dosages, as well as patient factors, such as poor adherence to medication regimens and lifestyle management. Few interventions to improve hypertension control have had resounding, sustained effects. Therefore, finding ways to improve hypertension self-management remains a significant challenge (Bokhour et al., 2012). Patients' perceptions of the cause and course of hypertension, experiences of hypertension symptoms, and beliefs about the effectiveness of treatment are inherently related to different hypertension self-management behaviors. Patients' daily-lived experiences, such as an isolated lifestyle, serious competing health problems, a lack of habits and routines, and barriers to exercise and prioritizing lifestyle choices, may also interfere with optimal hypertension self-management (Bokhour et al., 2012). The current study focused on two factors that increase the demands of HTN self-management: the number of instrumental activities of daily living impairments and the number of diagnosed chronic illnesses with which the Veteran is coping.

Number of instrumental activities of daily living (IADL) impairments. IADL impairments are condition-specific factors having great potential to interfere with hypertension self-management. They include impairments of: cleaning, meal preparation, doing laundry, grocery shopping, making telephone calls, and taking prescribed medications. As these necessary life

activities become impaired, the SM demands of hypertension increase. The onset of IADL disabilities represents the impact of age-related comorbid conditions, such as hypertension, that can affect a person's ability to maintain an independent lifestyle (Rajan, Hebert, Scherr, Mendes de Leon, & Evans, 2012). The ability of older persons to function independently depends on their ability to perform certain physical and cognitive functions (Rajan et al., 2012).

Number of diagnosed chronic illnesses. This factor affects potential capacity to self-manage. Chronic illnesses generally cannot be prevented by vaccines or cured by medication, nor do they just disappear. Hypertension is only one of many chronic illnesses a Veteran may be diagnosed with, leading to a conundrum in self-management. As the number of chronic illnesses increases, the demands of SM increase. Managing multiple conditions separately can be burdensome, even harmful, and this concern is particularly relevant for older adults (Tinetti et al., 2011). Multiple chronic conditions co-occur in almost 50% of persons aged 60 and older (Tinetti et al., 2011). Self-management in the presence of multiple chronic conditions is more complex than management of a single chronic illness because it involves an iterative prioritization of changing needs/conditions (Morris, Sanders, Kennedy, & Rogers, 2011) and consideration of the potential conflicts in treatment strategies among the multiple conditions (Bratzke et al., 2015).

Self-Management Behavior

Home telehealth utilization rate. Veterans enrolled in the home telehealth program submit data and information regarding their own health status to the VA, making this communication Veteran-initiated. Although VA guidelines mandate 100% participation, the home telehealth utilization rate represents a personal decision Veterans make regarding how often the Veterans choose to take their blood pressure and transmit results.

According to the VA, telehealth service uses health informatics, disease management, and telehealth technologies to target care in addition to case management to improve access to care, thereby improving the health of Veterans. Telehealth changes the location where health care services are routinely provided. Telehealth within the VA helps ensure that Veteran patients get the right care in the right place at the right time, and it aims to make the home into the preferred place of care whenever possible. The value the VA derives from telehealth is not in implementing telehealth technologies alone but in how the VA uses health informatics, disease management, and telehealth technologies to target care/case management, thereby facilitating access to care and improving the health of Veterans.

Clinical Outcome

Blood pressure target maintenance. In the study, blood pressure target maintenance is best considered an outcome reflecting health status: prevention, attenuation, stabilization, or worsening of the condition. The current study focused on Veterans in a range of ages, with and without diabetes. Because of patient variability, blood pressure target groupings have been set accordingly, to assure targets being met or not met.

Purpose of Study

The purpose of this study was to explore whether the risk and protective factors of age, ethnicity/race, marital status, living arrangement, number of diagnosed chronic illnesses, and number of instrumental activities of daily living (IADL) impairments, along with the SM behavior home telehealth utilization rate, contribute to predicting success in maintaining blood pressure targets by Veterans who are participating in home telehealth services to manage hypertension.

Research Questions

- 1) To what extent and manner do the risk and protective factors predict the home telehealth utilization rate?
- 2) To what extent and manner do the risk and protective factors predict the clinical outcome of blood pressure target maintenance?
- 3) Does the home telehealth utilization rate mediate the relationship between risk and protective factors and the clinical outcome of blood pressure target maintenance?

Significance to Nursing

Self-management in general has become a major component of the national nursing research agenda (NIH, 2013). Research by nurse scientists continues to show that self-management strategies are empowering patients to understand their conditions and take responsibility for their health (NIH, 2013). Patients taking responsibility for their health implies that there is a change in locus of control in their health care. As noted by NIH (2013), patients were expected to follow medication prescription and treatment plans with little understanding or knowledge of their use or purpose (NIH, 2013). To date, self-management research has addressed hypertension, organ failure, pulmonary disease, diabetes, HIV/AIDS, cancer, arthritis, pain, and sleep/fatigue (NIH, 2013).

The growing prevalence of chronic conditions has been exacerbated by changing societal demographics, increasing expectations of the public to be involved in their health care, and practice standards reinforcing patient centeredness (Institute of Medicine [IOM], 2001; Registered Nurses' Association of Ontario [RNAO], 2010). The shift in health care from provider-oriented to patient self-management models will influence the work of many nurses.

Nurses will have a better understanding of how patients perceive hypertension, allowing for better patient health education and talking points required at the bedside for controlling this chronic condition. Nurses will be encouraged to examine their role within the health care system and nursing education to realign care approaches to adopt more effective chronic disease management strategies (RNAO, 2010). Such changes allow patients to become vocal stakeholders in their health care, giving them greater control of their own outcomes, and fulfilling the self-management requirements of the IOM.

Nurses understand that hypertension is closely related to lifestyle. SM represents an opportunity for direct intervention at the individual level with the potential for favorable impacts on health and health behaviors. A hypertension approach emphasizing SM, tailored to Veterans and their circumstances, may arguably be effective across the prevention spectrum. The approach could establish a pattern for health early in life (primary prevention) and provide strategies for mitigating illness and managing it in later life (secondary and tertiary prevention) (Grady & Gough, 2014).

Results from the current study could be used to inform all providers, care coordinators, and clinicians about ways in which the Veteran population can better self-manage hypertension. Results also have the possibility of generalization to the general adult population dealing with all chronic illnesses. Since many chronic illnesses see a crossover effect due to lifestyle choices, there is potential to reach a wider audience than just people with hypertension.

Chapter Summary and Organization of the Dissertation

The chronic illness of hypertension continues to be one of the greatest chronic illness health care challenges of our time, and the extent to which hypertension pervades the Veteran population is considerable. For example, hypertension is the most common diagnosis among

Veterans, with an approximate 15,000 veterans hospitalized for stroke every year, costing an estimated \$111 million (VA/DoD, 2014). The high prevalence of hypertension found in the Veteran population suggests a need to better define the risks and benefits associated with the diagnosis and treatment of hypertension. Only by working together can Veterans and Health Care Providers (HCPs) address the chronic illness of hypertension. For both provider and patient, military participation is an often-overlooked, early-adulthood experience that has potential to shape a range of later-life health and health-related outcomes (London & Wilmoth, 2006).

Home telehealth involves the use of communications technology to deliver health services in situations where the care recipient is separated by distance from the care provider (Hogan et al., 2011). Peripheral devices, such as blood pressure cuffs, can also connect to the messaging device for easy data downloading and transmission (Hogan et al., 2011). VA home telehealth service has potentially presented a self-management intervention vehicle for Veterans to utilize when self-managing hypertension in their homes. Using a self-management approach allows what are normally seen as simple demographic variables to become meaningful risk and protective factors. This study is among few to use such a method. The study examined whether risk and protective factors—such as age, ethnicity/race, marital status, living arrangement, number of diagnosed chronic illnesses, and number of instrumental activities of daily living (IADL) impairments—along with the SM behavior telehealth utilization rate, contribute to predicting success or difficulty for Veterans meeting blood pressure target maintenance. Chapter 2 will include an expanded review of the literature that is directly related to the purpose of this study and the conceptual framework. How prior researchers have used traditionally demographic descriptors as variables will be explored. In Chapter 3 the methodology and rationale for this secondary analysis of data from a primary study is described. Chapter 4 is dedicated to the

findings of data analysis. Chapter 5 expands on the statistical relationships described in Chapter 4 by examining meanings of those relationships.

CHAPTER 2

Review of Literature

The literature on how risk and protective factors—age, ethnicity/race, marital status, living arrangement, number of diagnosed chronic illnesses, and number of activities of daily living impairments—have been utilized in past studies regarding Veterans with HTN is reviewed in the chapter. The chapter is organized in the order of search strategy, results, discussion, and summary.

Search Strategy

A literature search was conducted using the databases CINAHL, PubMed, PsychInfo, and ScienceDirect. Key words used were Veterans, Hypertension, and Self-Management, as well as useful synonyms, such as blood pressure, self-care, and self-efficacy. Time parameters were not limited, as use of self-management in Veteran health care is a relatively recent phenomenon, making it chronologically self-limiting. Only articles written in English were accepted. Articles that did not reference U.S. military Veterans were not accepted for initial review. The initial literature search brought 313 articles. Removal of duplicate articles left 187 articles for abstract review. After abstract review, 79 articles were accepted for in-depth review to ensure they met the stated purpose of this literature review. No further articles meeting inclusion criteria were discovered through search of references. After full review, 31 articles met the full inclusion criteria for this literature review and were accepted by the author. A PRISMA (preferred Reporting Items for Systematic Reviews and Meta-Analysis) diagram follows.

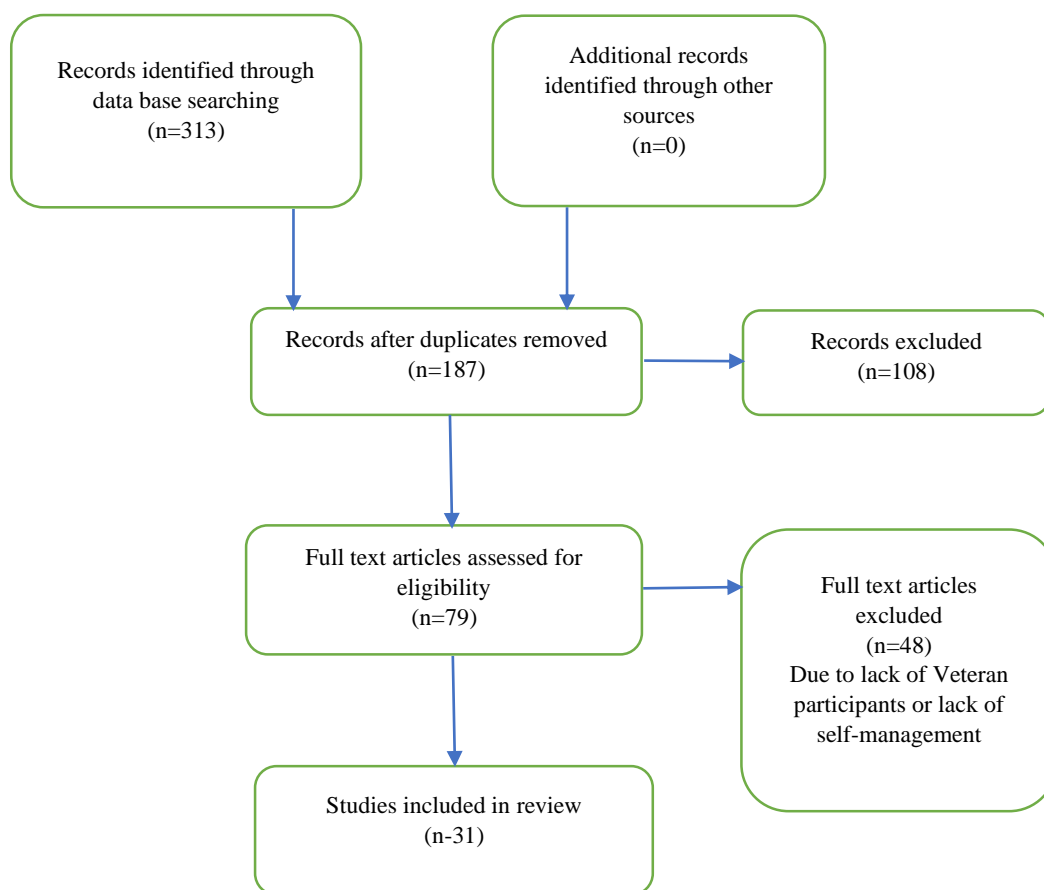


Figure 2
Veterans with hypertension self-management PRISMA

Search Results

Included as an appendix is a full evidence table detailing all articles used in this review of the literature (Appendix A). Some studies were found in this literature review that had been used in multiple articles by multiple authors conducting varying research. Information from the multiple articles related to the studies may be easier to follow by grouping articles that were focused on the same primary study, with the major study having the largest number of articles first. The study descriptions, which come after the informational table, all begin with their

assigned acronym and are in alphabetical order. As a summary aid for understanding the studies used, a short informational table has been included (Table 1).

Table 1

Multiple-Article Descriptions

Study Name	Purpose	Population	Results/Significant findings
The Veterans' Study to Improve the Control of Hypertension (V-STITCH), 2004	A nurse-delivered intervention study targeting patient factors: perceived risk of hypertension, memory, literacy, social support, health care provider (HCP) relationships, therapy side effects, missed appointments, medication refills, and health behaviors	Primary care providers at one North Carolina-based clinic ($n=30$ providers; $n=588$ HTN patients) were randomized to an intervention or control group	Rates of BP control for all patients receiving the patient behavioral intervention improved from 40.1% to 54.4% at 24 months Patients in the non-behavioral intervention group improved from 38.2% to 43.9%
The Adherence and Intensification of Medications (AIM) study, 2010	Have patients meet with a clinical pharmacist trained in motivational interviewing-based behavioral counseling approaches and authorized to make BP medication changes, or decide on continuing usual care The primary outcome was the relative change in systolic blood pressure (SBP) measurements over time	$n=458$ participants and $n=16$ primary care teams from both Kaiser Permanente and the Department of Veterans Affairs 14-month period at five facilities, including two VA hospitals	The mean systolic BP decrease from 6 months before to 6 months after the intervention period was 9 mm Hg in both of the study arms. Mean systolic BP of eligible intervention patients were 2.4 mm Hg lower (95% CI, -3.4 to -1.5 ; $p<.001$) immediately after the intervention than those achieved by control patients. Although almost 90% of patients achieved short-term success, only 28% achieved long-term success. Baseline barriers to adherence were associated with lack of long-term success
Posts Working for Veterans Health (POWER), 2010	Determine the influence program factors had on participant engagement in the POWER intervention, a peer-led intervention designed to reduce hypertension, increase hypertension knowledge, and improve other relevant health behaviors, such as diet and exercise, among US Veterans involved in Veteran Service Organizations (VSOs) throughout Southeastern Wisconsin	$n=219$ hypertensive members from 58 VSOs	Hypertensive peer leaders lowered their systolic BP by 3.93 mm Hg and engaged in healthier behaviors compared with leaders from other groups Peer leaders reported that they gained health knowledge, skills, and confidence to perform as informational resources at their posts, resulting in greater levels of health support among post members

V-STITCH Study. The Veterans' Study to Improve the Control of Hypertension (V-STITCH) trial was a 2-year health services intervention. Primary care providers at one North Carolina-based clinic were randomized to an intervention or control group. Intervention providers received a patient-specific, electronically generated hypertension decision support system delivering guideline-based recommendations at each visit. Patients whose providers were in this group were randomly assigned to receive a telephone-administered intervention or usual care. The patient-level intervention involved needs assessment, followed by tailored behavioral and education models to promote medication adherence and improve specific health behaviors. Rates of BP control for all patients receiving the patient behavioral intervention improved from 40.1% to 54.4% at 24 months; patients in the non-behavioral intervention group improved from 38.2% to 43.9% (Bosworth et al., 2005; Cho et al., 2007; Hong et al., 2006; Hong et al., 2005; Powers et al., 2009; Powers et al., 2008; Shaw & Bosworth, 2012; Thorpe et al., 2008).

The V-STITCH study was found in eight of the articles in this review of the literature. It was a nurse-delivered intervention study that targeted patient factors, including perceived risk of hypertension, memory, literacy, social support, health care provider (HCP) relationships, therapy side effects, missed appointments, medication refills, and health behaviors (Bosworth et al., 2005; Cho et al., 2007; Hong et al., 2006; Hong et al., 2005; Powers et al., 2009; Powers et al., 2008; Shaw & Bosworth, 2012; Thorpe et al., 2008). An important feature of the nurse-delivered intervention is that it incorporated tailored information and feedback. Such tailored feedback is part of a self-management approach that can increase patient education regarding hypertension. Tailored feedback has been demonstrated to be effective in the areas of smoking cessation, reduction of dietary fat intake, and increase in use of mammography (Bosworth et al., 2005). The V-STITCH study has been used as a primary study to look at nurse-delivered interventions for

hypertension, factors associated with hypertension monitoring, medication adherence, perceived versus actual stroke risk, subjective versus objective evaluations of health, and participatory decision making (Bosworth et al., 2005; Thorpe et al., 2008; Shaw & Bosworth, 2012; Powers et al., 2009; Powers et al., 2008; Hong et al., 2006; Hong et al., 2005; Cho et al., 2007). When using the IFSMT, all interventions found in the V-STITCH studies would fall into the process portion of the theory.

A major strength of the V-STITCH study was its number of participants—it was the largest study found in this review of the literature. It originally consisted of 4,017 potential subjects, of which 588 were eventually enrolled. The framework of the V-STITCH study was the Health Decision Model (HDM). The HDM focused on health decisions and combined the influences of health beliefs and modifying factors with a contribution from patient preference literature (Bosworth et al., 2005). Other study strengths included a large geographical location, allowing for 40% African American participants and 23% of individuals with inadequate income (Bosworth et al., 2005).

The largest limitation in the V-STITCH study was that the study was primarily composed of male Veterans, making generalizability between sexes difficult. Another major limitation was that self-reporting of medication adherence was included in the data. This creates the potential of introducing bias, such as the halo effect (adherence over-reporting) and the issue of recall bias. In addition, because reports of non-adherence may potentially be more accurate than reports of adherence, self-reporting tends to underestimate the true extent of non-adherence by roughly 20% (Bosworth et al., 2005; Thorpe et al., 2008).

AIM study. The Adherence and Intensification of Medications (AIM) study was a cluster-randomized controlled effectiveness study that used a pharmacist interventionist. During

a 14-month period at five facilities, including two VA hospitals, primary care teams were randomized to either: (1) a program led by a clinical pharmacist trained in motivational, interview-based behavioral approaches and authorized to make BP medication changes, or (2) usual care. The mean systolic BP decrease from 6 months before to 6 months after the intervention period was 9 mm Hg in both of the study arms. The mean systolic BP of eligible intervention patients were 2.4 mm Hg lower (95% CI, -3.4 to -1.5; $P < .001$) immediately after the intervention than those achieved by control patients (Heisler et al., 2012; Klamerus, Kerr, Bosworth, Schmittiel, & Heisler, 2014).

In the AIM intervention, a Veteran was to meet with a clinical pharmacist trained in motivational, interviewing-based behavioral counseling approaches and authorized to make BP medication changes, or decide on continuing usual care (Heisler et al., 2012; Klamerus et al., 2014). During the intervention period, 945 patients with diabetes with HTN, who had persistently poor medication refill adherence or no evidence of medication intensification, had one or more encounters with a program pharmacist (Heisler et al., 2012; Klamerus et al., 2014). The dependent variables were short-term and long-term success of controlling blood pressure and following a medication plan. The independent variables were the patient's knowledge, skill, and confidence (efficacy) for SM (Klamerus et al., 2014).

Through the AIM study, it was found that reporting at baseline of one or more barriers to medication adherence—i.e., having less than a high school education, being female, and being African American—were each independently associated with not sustaining BP improvements achieved (Klamerus et al., 2014). In the end, the AIM study did rapidly lower systolic blood pressures (SBPs) among eligible intervention subjects, but there was no significant difference in blood pressure between intervention and control groups 6 months following the intervention

period (Heisler et al., 2012). Although almost 90% of patients achieved short-term success, only 28% achieved long-term success. Baseline barriers to adherence were associated with lack of long-term success (Klamerus et al., 2014).

The AIM study had 458 participants from both Kaiser Permanente and the Department of Veterans Affairs, making it one of the larger studies found in this literature review. Two of the articles found used the AIM program. One limitation was that the AIM study focused on patients who had problems at baseline, meaning that they may have been different from patients with poor BP control but had not had medication management problems (Klamerus et al., 2014). Another limitation was that the study only used returned surveys, making it more than likely that those returned were more motivated than those who did not, implying that those not returned would be missing BP values and have worse control (Klamerus et al., 2014; Heisler et al., 2012). Third, the exact duration of BP maintenance varied per patient, anywhere from 90 to 365 days (Heisler et al., 2012; Klamerus et al., 2014).

POWER study. The Posts Working for Veterans Health (POWER) study was conducted in a Veterans Service Organization (VSO) versus directly through the VA. Instead of relying exclusively on HCPs to serve as study interventionists, the study used peer leaders (Hayes et al., 2010; Mosack et al., 2012). All Veterans of Foreign Wars (VFW) posts received a digital bathroom scale, pedometers, and automated BP monitors. The professionally led groups held three, 90-minute sessions, which were advertised and repeated six times around the geographic location of the study (Southeastern Wisconsin), so that at least one meeting was convenient for all participants. Peer leaders were chosen and trained prior to leading any sessions. Then the peer-led sessions were held monthly at the post and included approximately 12-minute “health corner” presentations on a specific topic such as physical activity, medication adherence, or another

important topic. Peer leaders underwent eight mini-training sessions to equip them with a script to deliver the intervention. Hypertensive peer leaders lowered their systolic BP by 3.93 mm Hg ($P=.04$) and engaged in healthier behaviors compared with leaders from other groups (Hayes et al., 2010; Mosack et al., 2012).

The purpose of this study was to determine the influence program factors had on participant engagement in the POWER intervention, a peer-led intervention designed to reduce hypertension, increase hypertension knowledge, and improve other relevant health behaviors, such as diet and exercise, among US Veterans involved in VSOs throughout Southeastern Wisconsin (Mosack et al., 2012). The findings of this study substantiate previous research and suggest that health intervention models with volunteer peer health leaders could prove to be a viable tool toward enhancing Veteran health behavior change (Mosack et al., 2012). Two of the studies found in the literature review used POWER for their study.

GMCs (Group Medical Clinics). To evaluate the effectiveness of GMCs in the management of comorbid hypertension and diabetes, Edelman et al. (2010) conducted a two-site, randomized controlled trial (Edelman et al., 2010). The group medical visits were comprised of seven to eight patients and a multidisciplinary care team, with groups meeting every 2 months. At each visit, BP was checked, and values were noted. Patients also attended an educational session delivered by either the nurse or educator, and topics of the education sessions were tailored to members' needs. The pharmacist and the primary care internist reviewed patient medical records, BPs, and home blood glucose readings during each session and developed individualized plans for medication or lifestyle management directed toward improving BP and HbA1c (a marker for measuring blood sugar in diabetic patients) level (Edelman et al., 2010). Mean systolic BP

improved by 13.7 mm Hg in the intervention group and 6.4 mm Hg in the usual care group (Edelman et al., 2010).

HINTS study. Another study intervention involving self-monitoring and medication management was the Hypertension Intervention Nurse Telemedicine Study (HINTS). The HINTS study evaluated three telephone-based interventions in a four-group design: (1) nurse-administered, behavioral management; (2) nurse-administered, physician-directed medication intervention using a validated clinical decision support system; (3) combined behavioral management and medication management intervention; and (4) usual care (Bowen et al., 2013). All intervention patients were provided with a wireless home BP monitor and advised to monitor their BP daily. Both the behavioral management and medication management alone showed significant improvements at 12 months: 12.8% (95% CI, 1.6%–24.1%) and 12.5% (95% CI, 1.3%–23.6%), respectively. However, improvements were not sustained at 18 months. In subgroup analyses, among those with poor baseline BP control, systolic BP decreased in the combined intervention group by 14.8 mm Hg (95% CI, –21.8 mm Hg to –7.8 mm Hg) at 12 months and 8.0 mm Hg (95% CI, –15.5 mm Hg to –0.5 mm Hg) at 18 months, relative to usual care (Bowen et al., 2013).

The CITIES Trial. The Cardiovascular Intervention Improvement Telemedicine Study (CITIES) Trial was a study using a 2-arm approach delivered by clinical specialist pharmacists using a telehealth intervention with an education only control (Bosworth et al., 2018). The study included 428 Veterans, of which 50% were African American, and 85% were male. Of note, included in the study was an element of self-management delivering a behavioral, concomitant telemedicine intervention to improve treatment adherence, exercise, diet, weight, and smoking cessation. The primary outcome was the Framingham CVD Risk Score at 6 and 12 months.

Secondary outcomes pertinent to this review were systolic blood pressure and diastolic blood pressure measurements. Relative to the education control group, the clinical pharmacist delivered intervention did not show a reduction in CVD risk at 6 nor 12 months. Secondary systolic and diastolic differences were not mentioned in the findings nor conclusions (Bosworth et al., 2018).

ICVAMC Study. Wakefield (2011) conducted a single-site, randomized, controlled trial evaluating the efficacy of a nurse-management home telehealth and remote monitoring intervention to improve outcomes among veteran patients with diabetes and hypertension at the Iowa City Veterans Medical Center (ICVAMC). There were three arms: high-intensity, low-intensity, and usual care (Wakefield et al., 2011). Both intervention groups received care management from a study nurse that entailed weekday monitoring. Based on responses from patients in the intervention group, the nurse delivered follow-up in the form of providing additional health information, increased monitoring, or contacting a physician as needed (Wakefield et al., 2011). Both intervention groups were instructed to measure BP daily and blood glucose as directed by their physician. For the high-intensity group, the multidisciplinary study team developed a branching disease management algorithm that was programmed into study devices and focused on behavior modification and lifestyle adjustments. Patients in the low-intensity group were asked questions daily but were not exposed to the branching algorithm. The high-intensity patients had a significant decrease in systolic BP compared with the other groups at 6 months, and this pattern was maintained at 12 months (Wakefield et al., 2011).

PCC (Patient-Centered Care) Intervention. Roumie and colleagues (2011) conducted a cluster-randomized trial to examine effectiveness of three PCC interventions of increasing intensity in improving Veterans' BP control (Rounie et al., 2011). Providers were randomized to one of three groups: (1) provider education, (2) provider education and alert, and (3) provider

education and alert plus patient education (Roumie et al., 2011). Educational information was delivered to providers via e-mail with a Web-based link to guidelines. For providers in the alert-receiving arm, one-time, patient-specific electronic alerts were sent by the pharmacy to the prescribing provider via the patient's electronic medical record during a 1-week period. For the third arm, a personalized letter was sent to patients containing educational information and recommending use of behavioral strategies to improve BP control. Patients of providers who were randomly assigned to the patient education group had better BP control (138/75 mm Hg) compared with those in the provider education and alert or provider education alone groups (146/76 mm Hg and 145/78 mm Hg, respectively) (Roumie et al., 2011).

VSPP study. In a different study by Damush et al. (2016), a self-management framework was utilized to enable adherence to prescribed medications to reduce secondary stroke risk after prior stroke, referred to as the Veterans Stroke Prevention Program (VSPP). It has been shown that modifiable risk factors are most effectively managed via a combination of lifestyle and medication management through collaborative efforts of both patients and HCPs (Damush et al., 2016). This study was based on self-management interventions from the Stanford Chronic Disease Self-Management Program, a program centered on enhancing patient self-efficacy to manage symptoms (Damush et al., 2016), and the Chronic Care Model.

The hypertension cohort of the VSPP study (n=149) included subjects with medical records data that indicated blood pressure at discharge was uncontrolled (defined as >140/90 for non-diabetic and >130/80 for diabetic) or were prescribed at least one anti-hypertensive medication at discharge or were already taking an anti-hypertensive medication at admission. The intervention reached and promoted the implementation of secondary stroke self-management by veteran patients with an acute stroke/transient ischemic attack (TIA). The program's effectiveness

was mixed. The authors reported a significant increase in medication adherence for hypertensive stroke survivors assigned to the intervention group, while adherence for those assigned to the control group remained the same. There were no significant effects on patient self-efficacy or stroke-specific, health-related quality of life (Damush et al., 2016).

Panel Management to Improve Smoking and Hypertension Outcomes study. This Panel management study conducted an 8-month cluster-randomized controlled trial of panel management for improving hypertension and smoking cessation outcomes among Veterans (Schwartz et al., 2015). Although this study was not solely focused on hypertension, hypertension was a major component, and therefore should be included in this literature review. The study included 6,383 hypertensive Veterans receiving care through the Veterans Affairs New York Harbor facility. Teams assigned to the intervention groups worked with non-clinical Panel Management Assistants (PMAs) who monitored care gaps and conducted proactive patient outreach, including referrals, mail reminders and motivational interviewing by telephone. Measurements included mean systolic and diastolic blood pressure, as well as the proportion of patients with controlled blood pressure. Outcomes demonstrated that panel management support for primary care teams improved process, but not outcome variables among Veterans with hypertension (Schwartz et al., 2015).

The Veterans Affairs Project to Implement Diuretics trial. This study was a randomized clinical trial conducted at 13 Veterans Affairs primary care clinics from August 1, 2006, to July 31, 2008, with 12 months of follow-up (Kaboli et al., 2018). A total of 598 consented to participate. Statistical analysis was conducted from December 1, 2017, to September 12, 2018. The study objective was to test the efficacy of a patient activation intervention with financial incentives to promote thiazide prescribing. Patients were randomized to a control group

($n = 196$) or 1 of 3 intervention groups designed to activate patients to talk with their primary care clinicians about thiazides and hypertension: group A ($n = 143$) received an activation letter, group B ($n = 128$) received a letter plus a financial incentive, and group C ($n = 131$) received a letter, financial incentive, and a telephone call encouraging patients to speak with their primary care clinicians. Primary outcomes were thiazide prescribing and BP control. A secondary process measure was discussion between patient and primary care clinician about thiazides. Adjusted analyses demonstrated an intervention effect on thiazide prescribing at the index visit and 6-month visit, which diminished at the 12-month visit. For BP control, there was a significant intervention effect at the 12-month follow-up for group C (adjusted odds ratio, 1.73; 95% CI, 1.06-2.83; $p = .04$). Intervention groups exhibited improved thiazide discussion rates in a dose-response fashion: group A, 44.1% (63 of 143); group B, 56.3% (72 of 128); and group C, 68.7% (90 of 131) ($p = .004$) (Kaboli et al., 2018).

Discussion

Nine of the studies did make use of demographic variables, at least partially, as more than study population descriptors. Seven of these nine studies used race as a risk or protective factor (Hong et al., 2005; Powers, 2008; Shaw & Bosworth, 2012; Thorpe et al., 2008; Wang et al., 2004; Weidenbacher et al., 2015), but gave little attention to race in study results. According to Hong (2005), whites had lower perceived BP control compared to other races. Wang et al. (2004) and Weidenbacher et al. (2015) both note that Black and non-White females have higher rates of self-over-reporting of medication adherence. Powers et al. (2008) informed us that race played a significant role on perceived stroke risk estimation versus the Framingham Stroke Risk questionnaire. Results from Shaw and Bosworth (2012) indicate that there is a significant increase in systolic BP across 24 months among people who identify as minority status.

Thirteen of the studies used demographic variables solely to balance study groups, such as between intervention and non-intervention groupings. Seven of the studies did not include any mention of demographic variables at all. When combined, these twenty studies provided little information regarding demographic variable risk and protective factors.

Thorpe et al. (2008) gave a comparatively rich summary of risk and protective factors using demographic variables when looking at home BP monitor possession and usage. In the Thorpe article, those who were older, female, of higher socioeconomic status, and diagnosed with diabetes had the highest odds of owning a home BP monitor. Interestingly, the study results indicated that people who owned a home BP monitor and used it frequently had the highest odds of demonstrating lower rates of success when having BP taken at the physician's office (Thorpe et al., 2008).

Sixteen of the studies in this review of literature focused on HTN medication adherence, adjustment, and intensification (Bosworth et al., 2018; Bowen et al., 2013; Damush et al., 2016; Edelman et al., 2010; Heisler et al., 2012; Hong et al., 2006; Kaboli et al., 2018; Klamerus et al., 2014; Maciejewski et al., 2014; Roumie et al., 2011; Shaw & Bosworth, 2012; Schwartz et al., 2015; Sussman et al., 2012; Wang et al., 2004; Weidenbacher et al., 2015; Zikmund-Fisher et al., 2009). As noted by Hong et al. (2006), prior research has generally found that medication barriers, such as cost, location, and side effects are highly associated with poor medication adherence. Past research has also shown that patients tend to make rational choices when deciding to adhere to a medical regimen by weighing the medication barriers and net health effects of the medication (Hong et al., 2006). This idea becomes particularly problematic with anti-hypertension medication because HTN is an asymptomatic disease, where the treatments can

seem much worse than the disease itself for the patient (Hong et al., 2006; Zikmund-Fisher et al., 2009).

The HINTS study (Bowen et al., 2013) and the ICVAMC study by Wakefield (2011) demonstrated that using home BP monitoring and telephone-based communication between patient and caregiver could be an effective way for Veterans to self-manage BP targets at home. These two studies are close to the same design as the current study's primary study site. However, an important difference between the HINTS design and the home telehealth study in the current study is that all home telehealth utilization must be Veteran-initiated, demonstrating that a choice is being made by the Veteran each time a BP reading is taken. The ICVAMC study also allowed for nurse-initiated communication between Veteran and caregiver (Wakefield, 2011).

The POWER studies made a case for Veteran self-management of BP targets (Hayes et al., 2010; Mosack et al., 2012). These studies were focused on peer-to-peer interaction for support in healthy decision-making. It was noted that the peer leaders had a significant drop in BP measurements (Hayes et al., 2010; Mosack et al., 2012). It is reasonable to believe that Veterans making their own health choices and having control over their own health decisions could aid in lowering their own stress levels, and therefore BP measurements (Hayes et al., 2010).

Self-Management Theory

Use of traditionally demographic variables used in studies as context factors was not generally seen. Meaning had not been assigned other than HTN in its simplest terms, and there was rarely more than a mention of study participants being diagnosed with HTN to qualify for study purposes. Other risk and protective factors were used only as demographic variables with no meaning assigned behind them. The process of SM was primarily presented in the form of patient education and discussion, whether written or verbal.

Summary

Most interventions reported in this review of the literature effectively improved BP control by using a myriad of approaches. Interventions were successfully delivered by nurses, primary care providers, pharmacists, and even peers. Settings varied from home-based with telephone support to clinic- or community-based. Educational content, contact frequency, and intervention intensity were mixed throughout all the studies found.

Few studies found in this literature review used demographic variables as more than population descriptors. Several of these studies used demographic variables as a means to balance populations of the study arms. In the studies that did assign meaning to demographic variables, results demonstrated that minorities tended to have worse outcomes than non-minorities. Regarding home-based technology, unexpected results indicated that those who owned BP machines and used them the most tended to have the worst readings in when taken in the clinical setting (Thorpe et al., 2008).

The current study used traditionally demographic variables and assign meaning to them as risk and protective factors in the decision-making process. These factors, whether singularly or in groupings were tested to determine if they could predict which groups of Veterans may require a greater “dose” of intervention compared to those who are self-managing their blood pressures appropriately. There exists potential that a one-size-fits-all approach of mandating 100% participation in response rate could be unreasonable for all Veterans. The next chapter will describe the methodology and rationale for this secondary analysis of data from a primary study.

CHAPTER 3

Methods

This study is a secondary analysis of data from a primary study conducted at a VA medical center in the Midwest regarding VA home telehealth services. This chapter is organized starting with an overview of the primary study. This is followed by the methods for the current study including study design, sample, operational definitions, and data analysis plan.

Overview of Primary Study

The primary study was titled, “Factors promoting Positive Outcomes for Veterans using Home Telehealth. In summary, the study investigates Veterans using VA HT services in the Milwaukee, WI area using both quantitative and qualitative methods. The purpose of the primary study was to explore Veterans’ perceptions of facilitators and barriers to the utilization of home telehealth services. Secondly, the primary study examined the relationship between Veterans’ characteristics, health/eHealth literacy, and utilization of home telehealth services. Wagner’s Care Model guided the study, with health/e-Health literacy incorporated into the informed, activated patient using home telehealth. The foci of the research were those skills, abilities, and characteristics that encouraged or impeded the informed, activated patient using home telehealth. A mixed-methods, cross-sectional design was employed. Data were collected with surveys, semi-structured interviews, and chart reviews. The sample consisted of 560 primary care Veterans. Inclusion criteria were: enrolled in home telehealth using one of four home telehealth devices for longer than 6 months with one of five chronic conditions (hypertension, heart failure, diabetes, depression, and chronic respiratory disease) with sufficient recorded data upon chart review.

Chart review included Veteran characteristics, clinical outcomes, home telehealth utilization, and demographics.

Current Study

The current study was a cross-sectional, correlational study using secondary analysis of quantitative data from the hypertension portion of the primary study. The sample for the current study was the 204 Veterans who participated in the primary study and who were identified in the hypertension arm of the primary study. Inclusion criteria were that the Veterans were diagnosed with hypertension and using VA home telehealth services for at least six months prior to joining the study. The purpose of having used home telehealth services for at least six months prior to joining was to ensure the Veteran had significant experience using the technology correctly. Using the computer application GPower 3.0.10, power analysis demonstrated to achieve 80% power, a total of 103 participants would be required for six predictors.

Variables The risk and protective factor predictors were: age in years, ethnicity/race (black, white, Hispanic/Latino, Native American, Asian American, Other), marital status (married, widowed, divorced/separated, never married), living arrangement (lives alone, lives with spouse, lives with other adult, lives with dependent child, lives in assisted living, lives in a long-term care or skilled nursing facility), number of diagnosed chronic illnesses, and number of instrumental activities of daily living (IADL) disabilities (cleaning, meal preparation, doing laundry, grocery shopping, making telephone calls, and taking prescribed medications).

The outcome variables were home telehealth utilization rate and blood pressure target maintenance. Home telehealth utilization rate was considered the self-management behavior in the model, as it represented a daily choice on the part of the Veteran. All contact between the Veteran and VA home telehealth services was Veteran initiated. Gaps in daily BP transmissions

were due to the Veteran deviating from the VA mandated 100% daily BP measurement and transmission. Home telehealth utilization rate was considered a potential mediator of relationships between risk and protective factors and blood pressure target maintenance. Therefore, home telehealth utilization rate was used as predictor variable for a portion of the data analysis. A table of how the risk and protective factors were operationalized is provided (Table 2).

Table 2

Operational Definitions

Risk & Protective Factors	Operational Definition	Primary Study Code	Current Study Code
<i>Ethnicity/race</i>	Categorical variable: Black, White, Hispanic/Latino, Native American, Asian American, Other	1 = “Black” 2 = “White” 3 = Hispanic/Latin 4 = Native American 5 = Asian American 6 = Unknown	0 = White 1 = Black
<i>Age in years</i>	Continuous variable: range from 18 to 90 years of age. To protect study participants, the VA puts all Veterans who are 90+ years of age into a single group of 90 years old.	Continuous: 18-90 years of age	Continuous: 18-90 years of age
<i>Marital status</i>	Categorical variable: Married, Widowed, Divorced/Separated, Never Married	1 = Married 2 = Widowed 3 = Divorced 4 = Separated 5 = Never Married	1 = Married 2 = Widowed 3 = Divorced 4 = Separated 5 = Never Married
<i>Living arrangement</i>	Categorical variable: Lives alone, lives with spouse, lives with other adult, lives with dependent child, lives in assisted living, lives in long term care or skilled nursing facility	1 = Lives alone 2 = Lives w/spouse 3 = Lives w/another adult 4 = Lives w/child 5 = Assisted living 6 = LTC/SNF	1 = Lives alone 2 = Lives w/spouse 3 = Lives w/another adult 4 = Lives w/child 5 = Assisted living 6 = LTC/SNF
<i>Living Situation</i>	Categorical variable: Lives with spouse, lives alone, lives with others	Not in primary study	1 = Lives with spouse 2 = Lives alone 3 = Lives with others
<i>Number of instrumental activities of daily living (IADL) impairments</i>	Categorical variable: Cleaning, meal preparation, doing laundry, grocery shopping, making telephone calls, and taking prescribed medications	1 = Making telephone calls 2 = Taking prescribed medications 3 = Cleaning 4 = Meal preparation 5 = Doing laundry	Continuous: Range 1-6

Risk & Protective Factors	Operational Definition	Primary Study Code	Current Study Code
	Transformed into continuous variable for current study.	6 = Grocery shopping	
<i>Number of diagnosed chronic illnesses</i>	Continuous variable: Including, but not limited to: HTN, diabetes mellitus, COPD, obesity, chronic heart failure, sleep apnea, depression, and arthritis	Continuous: Range 1-15	Continuous: Range 1-15
Self-management Behavior	Operational Definition		
<i>Home telehealth utilization rate (HT Utilization Rate)</i>	Interval variable: 0-100% Individual average weekly response rate of the most recent 12 weeks or for full 12 weeks between 6/10/13-12/31/14	Numerical: Range 0-100%	Numerical: Range 0-100% Also categorized as: 0 = < 70% 1 = ≥ 70%
Clinical Outcome	Operational Definition		
<i>Maintaining blood pressure targets (HTN Target Maintenance)</i>	Nominal variable: Met/Not Met <ul style="list-style-type: none"> • HTN only: BP target is <140/90 • HTN and diabetes: BP target of <140/80 • HTN and diabetes and greater than 80 years of age: BP target is <160 systolic and <90 diastolic 	1 = met 2 = not met	0 = Not met 1 = Met

Location All data were coded and securely kept at the Office of Nursing Research at the site. The code key was kept in a separate, locked cabinet in the office where only the Director had the key. All analyses were conducted on using on-site computers. The computers were kept in a separate, locked office from the key and required approved VA user access.

Preliminary Data Analysis Preliminary data analysis was conducted using version 21 of SPSS. Descriptive statistics were used to describe and summarize sample characteristics. Frequencies and percentage were calculated for categorical variables and means, and standard deviations were calculated for continuous variables. Maximum and minimum values were checked to see if they fell within the reasonable range. Histograms were created for continuous variables to examine their distributions and determine outliers. The data values identified as

outliers were double checked to make sure they made sense. The nonsense or impossible values were corrected or removed before data analysis. Missing values were identified and reviewed for patterns of missingness. Little's Chi-square test was used to check whether or not missing data was missing completely at random. Then a decision was made regarding dropping cases (listwise deletion) or imputing data. The assumption was normal data distribution, but if skew was detected, a non-parametric method for analysis was used for transformation.

A correlational matrix was conducted between each of the predictor variables and outcome variables. If the predictor variables and outcome variables were both continuous, Pearson correlation was conducted. If the outcome variable was continuous and the predictor variables categorical, point biserial correlation was conducted. If both the outcome variable and predictor variables were categorical, a Chi-square test was used. Predictor variables not related to outcome variables were not included in the final analyses.

Because this study was a secondary analysis of data, there were limitations to how the categories inside the predictor variables ethnicity/race, marital status, and living arrangement could be used for analyses. Due to these predictor variables having several categories in them, not all categories could be used for statistical analyses. Predictor variables were limited to two categories and a reference group. In the predictor variable race/ethnicity, the two categories were Black and White, while all others were considered "other" as a reference group. For marital status, married and separated were the two categories, where the reference group was all "others". Living arrangement was operationalized as living with another adult and living alone as two categories; the others were the reference group. Due to overlap, the predictor variables marital status and living arrangement were combined into a new predictor variable.

Primary Data Analysis The data analysis plans are given below for each of the research questions:

- 1) A multiple regression model was used to examine to what extent and manner the risk and protective factors of age, ethnicity/race, marital status, living arrangement, number of diagnosed chronic illnesses, and number of IADL impairments predict home telehealth utilization rate. In the regression model, predictor variables were those identified through preliminary analyses; the criterion variable was the home telehealth utilization rate.
- 2) A logistical regression model was used to examine to what extent and manner the risk and protective factors of age, ethnicity/race, marital status, living arrangement, number of diagnosed chronic illnesses, and number of IADL impairments predicted the clinical outcome of blood pressure target maintenance. In the regression model, predictor variables were identified through preliminary analyses; the criterion variable was the clinical outcome of blood pressure target maintenance.
- 3) A logistical regression model and Sobel test were used to examine whether telehealth utilization rate mediated relationships between the risk and protective factors (age, ethnicity/race, marital status, living arrangement, number of diagnosed chronic illnesses, number of IADL impairments) and the clinical outcome of blood pressure target maintenance. In this regression model, blood pressure target maintenance was the dependent variable and home telehealth utilization rate was a mediator between risk and protective factors as identified in preliminary analyses. Based on results of the regression models, a Sobel test was used to assess whether the mediation effect was statistically significant. From the regression models, unstandardized regression coefficients with standard errors were calculated for the associations between the predictor variables and

the mediator and between the mediator and the dependent variable. The Sobel test could then be used to test whether the mediation effect was statistically significant.

Ethical Conduct of Research

This author declares no conflicts of interest. This study was deemed exempt by the University of Wisconsin-Milwaukee Independent Review Board (Appendix B).

Limitations

Study limitations included the fact that there were no female Veterans included in the study data. This made it difficult to meaningfully translate newly discovered information to women Veterans who may be dealing with hypertension and using VA home telehealth services. Also, this study was a secondary analysis of already existing data. Therefore, there was no opportunity to add variables and the existing variables may not have matched the SM constructs as strongly.

Summary

This study was a secondary analysis of data from a primary study conducted at a medical center in the Midwest regarding VA home telehealth services. The study used available demographic variables from a primary study as risk and protective factors for a self-management perspective on HTN control via home telehealth. By assigning meaning to the risk and predictive factors, there was potential to discover the extent these factors affect health decisions of Veterans enrolled in VA home telehealth. The next chapter is focused on analysis of the data and discovery of which predictors, and to what extent they predict, success in home telehealth utilization rate and maintenance of blood pressure targets.

CHAPTER 4

Findings

This chapter presents the findings of this secondary analysis. The preliminary analyses are presented, including assessment of missing data, skewness, and outliers. This also includes correlations and other relationships that inform decisions about variables to be included in the primary analyses. The results pertinent to the primary analyses for the research questions follow.

Preliminary Analyses

Missing data. The data set of 204 veterans was carefully reviewed for any missing data per the data analysis plan outlined in Chapter 3. Review of the data set revealed 97 participants with missing values from the predictors living arrangement, number of chronic conditions, and number of IADL disabilities. This level of missing data was most likely not random and not appropriate for imputation of missing values. Therefore, the 97 participants with missing values were removed. One of the limitations to secondary data analysis is that the data set cannot be added to or changed. Once the 97 participants missing data were removed, all remaining participants had no missing values and 80% power was still achieved for this study with more than the necessary 103 participants.

Skewness. Preliminary analyses were performed to ensure there was no violation of the assumptions of normality, linearity, and homoscedasticity of continuous data. None of the continuous data was found to be skewed and no outliers were noted.

Demographic characteristics of study participants and categorical variables

All participants in the final data set were male. The demographic characteristics are presented (Table 3). The mean age was 73.97 years with few participants below the age of 60.

The few participants over 90 were grouped with those 80 and older. The majority of participants were married and living with their spouse or in a living arrangement with others. Most participants were white.

The categorical predictor frequencies were analyzed, including ethnicity/race, marital status, living arrangement. Once the 97 participants missing values were removed, preliminary frequencies for the ethnicity/race predictor demonstrated the study sample was comprised of entirely black and white men. The black population was comprised of 27 participants and the white population was comprised of 80 participants. Preliminary frequencies were next done with marital status. Results indicated that 60 participants were married, 13 widowed, 23 divorced/separated, and 11 never married. Next, preliminary frequencies were done for Living Arrangement. Results showed 38 participants living alone, 54 living with their spouse, 15 living with another adult/living in assisted living conditions.

Any cells with data less than 5 were combined with the most meaningfully similar cell. This can be seen in Veterans in their forties and fifties, veterans greater than 80 years of age, divorced/separated Veterans, and those in assisted living joining living with other. The combining of decades in the age predictor is sensible because it follows the natural groupings in the psychology of aging. Veterans in their forties and fifties are considered adult in their psychology. The sixties and seventies represent the psychology of older adulthood. The eighties and nineties are psychologically grouped as the elderly. According to the psychology of aging, each of these groups will have different needs, which may be reflected in their use of home telehealth services or blood pressure maintenance targets.

Combining the divorced and separated groups in the Marital Status predictor is sensible, as both represent having experienced marriage but choosing to separate from a spouse.

Crosstabulation of the Marital Status and Living Arrangement predictors indicate that all divorced and separated Veterans either live alone or with others (Table 4). Veterans in assisted living conditions are naturally living with another person who, presumably, is taking care of them. A table of participant characteristics is shown below (Table 3).

Table 3

Characteristics of Participants

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>%</i>
Age	73.97	10.78		
40-59			8	7.5
60-69			37	34.6
70-79			24	22.4
≥80			38	35.5
Marital Status				
Married			60	56.1
Widowed			13	12.1
Divorced/Separated			23	21.5
Never Married			11	10.3
Living Arrangement				
Lives Alone			38	35.5
Lives with Spouse			54	50.5
Lives with Other (plus Assisted Living			15	14.0
Ethnicity/Race				
Black			27	25.2
White			80	74.8

A crosstabulation was done to find potential overlap in the Marital Status and Living Arrangement predictors. Crosstabulation results indicated that married Veterans were living with their spouse a high percentage of the time; however, some were not (Table 4). With this knowledge, a new variable was created, Living Situation, to better reflect Veteran daily lived experiences (Table 5). The new predictor Living Situation identified Veterans who were married and living with their spouse, versus those living alone (married or not), and those living with

another person. Dummy variables reflecting lives with spouse, lives alone, and lives with other, were then created for the purpose of running data analyses.

Table 4

Crosstabulation Marital Status x Living Arrangement

	Lives Alone	Lives with Spouse	Lives with Other	Total
MaritalStatus				
Married	6	54	0	60
Widowed	6	0	7	13
Divorced/ Separated/ Never Married	26	0	8	34

Table 5

Living Situation

	<i>n</i>	<i>%</i>
Lives with Spouse	54	50.5
Lives Alone	38	35.5
Lives with Other	15	14.0

Other Variable Descriptions. Continuous predictors in this study were number of Chronic Conditions, number of IADL Disabilities, and HT Utilization Rate. HT Utilization Rate was also an outcome variable in answering the first research question. Blood pressure Target Maintenance was an outcome that was measured as dichotomous (met = 88.8%/not met = 11.2%). Calculated means and standard deviations for the continuous predictors are shown (Table 6). On average, Veterans reported more than 8 chronic conditions with difficulty performing about 2 instrumental activities of daily living.

Table 6*Description of Variables*

	Range	<i>M</i>	<i>SD</i>
Chronic Conditions	2-19	7.85	2.57
IADL Disability	0-6	1.84	1.84
HT Utilization Rate	7-100	64.38	25.89

Correlational Analyses. Pearson correlation coefficients were calculated for relationships between the outcome variable HT Utilization Rate and the continuous predictors Age in Years, Chronic Conditions, and IADL Disabilities. A moderate positive correlation was found between HT Utilization Rate and Age in Years, indicating a statistically and clinically significant relationship between the two variables. This relationship indicates that as age increases, so does the HT Utilization Rate. Clinically, it indicates that older Veterans are using HT services more often than younger veterans. A weak positive relationship was found between HT Utilization Rate and the number Chronic Conditions, indicating a significant linear relationship between the two variables. This relationship means that with more chronic conditions diagnosed, the HT Utilization increases. Also, a weak positive relationship was found between IADL Disabilities and number of Chronic Conditions, indicating a significant linear relationship between the two variables. This relationship indicates that as the number of IADL disabilities increases, so does the number of diagnosed chronic conditions (Table 7).

Table 7*Pearson Correlations of Continuous Variables*

	HT Utilization Rate	Age	Chronic Conditions	IADL Disability
HT Utilization Rate	---	---	---	---
Age	.34**	---	---	---
Chronic Conditions	.22*	.09	---	---
IADL Disability	.07	.18	.20*	---

* $p < 0.05$ (2-tailed)

** $p < 0.01$ (2-tailed)

Point biserial correlations were done between the continuous outcome variable HT Utilization rate and individual binary predictor variables (table 8). Since point biserial is a form of Pearson correlation, it tests for linear relationships between variables. No significant relationships were identified. Therefore, HT Utilization Rate is not related to HTN Target Maintenance.

Table 8

Point Biserial Correlations of Outcome Variables

	HTNTargetMaintenance	Ethnicity/Race	LivSpouse	LivAlone	LivOther
HT Utilization Rate	.11	.08	-.07	.03	.05

Other Analyses. The predictor IADL Disability, when first used as a continuous predictor, had a substantial portion of participants that did not have IADL disabilities (38.3%). To test if having any IADL disability versus none might have an effect, a new predictor was created labeled Positive Disability. This new predictor was then used as an attempt to better capture if having any IADL disability would have significant relationships with the outcomes. No further significant relationships were discovered.

The VA mandates 100% HT utilization rate; however, it permits HT utilization rate down to 70% due to office staffing 5 days out of the week. Therefore, another variable was created to reflect those Veterans over the 70% HT utilization rate threshold. Using the new variable, crosstabulations were done between it, HTN Target Maintenance, and the predictors. No further statistically significant relationships were found.

Primary Analysis

Testing for significant relationships between the outcome variable HTN Target Maintenance and predictor variables was conducted. Crosstabulations were done between the

outcome variable HTN Target Maintenance and the predictor variables age, race/ethnicity, number of chronic conditions, and IADL disabilities. The crosstabulations were combined into a single table, with each predictor displayed following identified natural breaks. For age, all Veterans who did not make their blood pressure target maintenance targets were less than seventy years old. Race/ethnicity was organically dichotomous in the data. Number of chronic conditions had two natural breaks; however, all values less than five needed to be combined. Therefore, the natural break became between eight and nine chronic conditions. Since greater than one third of the sample had no IADL disabilities, it was made dichotomous for the table (Table 9). Only one significant relationship was found, which was between age and blood pressure target maintenance. All other relationships were not of statistical significance.

Table 9

HTN Target Maintenance Crosstabulations (n =107)

	<i>Met</i>	<i>Not Met</i>
Age		
≤ 69	29 (70.7%)	12 (29.3%)
≥ 70	66 (100%)	0 (0%)
Race/Ethnicity		
Black	22 (81.5%)	5 (18.5%)
White	73 (91.3%)	7 (8.7%)
Chronic Conditions		
≤ 8	61 (64.2%)	7 (58.3%)
≥ 9	34 (35.8%)	5 (41.7%)
IADL Disabilities		
Disabilities	58 (87.9%)	8 (12.1%)
No Disabilities	37 (90.2%)	4 (9.8%)

In the first part of data analysis, statistically significant relationships were identified in order to run regression models to answer the three research questions. The first research question would require a multiple regression model, since the outcome variable was continuous. The predictors age and number of diagnosed chronic illnesses were used in the first research question

since they had statistically significant relationships with the outcome variable HT utilization rate. The second research question required a logistical regression model for the binary outcome variable of blood pressure target maintenance using age as the only predictor with a statistically significant relationship. To test for relationship mediation in the third research question, a logistical regression model was required for the binary outcome blood pressure target maintenance. However, the prior outcome variable HT utilization rate needed to be added as a predictor in order to test for mediation.

Research Question 1: A multiple regression model was used to examine to what extent and manner do the risk and protective factors age, number of diagnosed chronic illnesses, and being positive for IADL impairment predict home telehealth utilization rate. In the regression model, predictor variables were age and number of diagnosed chronic illnesses; the criterion variable was the home telehealth utilization rate. Results indicated that age, as the strongest predictor, and number of chronic conditions had a statistically significant positive relationship with home telehealth utilization rate (Table 9). The meaning behind this relationship is that as age and number of chronic conditions increase, so does HT Utilization Rate. The independent variables explain 15% of the variance.

Table 10

Multiple Regression for Research Question 1

	<i>b</i>	<i>SE</i>	<i>Beta</i>	<i>Sig</i>
Age	.78	.22	.33	.001
Chronic Conditions	1.85	.94	.18	.05

$n = 107, r = .39, R^2 = .15, F = 6.22, p = .001$

Research Question 2: A logistical regression model was initially in the data analysis plan. However, since only one predictor was found to be significant, and the outcome dichotomous,

this research question was better answered using point biserial correlation. Therefore, point biserial correlation was used to examine to what extent and manner did the risk and protective factor age predict the clinical outcome of blood pressure target maintenance. Results indicated that age had a statistically significant positive relationship with blood pressure target maintenance ($n = 107$, $r = .38$, $R^2 = .144$, $p < .001$). The independent variable explains 14.4% of the variance. The results indicate that as age increases, so does blood pressure target maintenance.

Research Question 3: A logistical regression model was initially in the data analysis plan for this question. However, no significant relationship was found between HT utilization rate and blood pressure target maintenance. Without a relationship identified between the two variables, mediation could not be identified. Therefore, home telehealth utilization rate did not mediate in the relationship between age in years and the clinical outcome blood pressure maintenance target.

Summary

This chapter focused on analysis of the data and discovery of which variables could be predictors, and to what extent they could predict, success in home telehealth utilization rate and maintenance of blood pressure targets in Veterans using home telehealth services. It was discovered the age and number of chronic conditions regression model had a moderate, positive correlation with HT utilization rate. Age also had a moderate, positive correlation with blood pressure target maintenance. It was also discovered that home telehealth utilization rate did not mediate in the relationship between the predictor age and the clinical outcome blood pressure target maintenance. The next chapter discusses possible meanings behind the data analyses and

how knowledge gained from this study can be utilized in clinical practice, as well as areas for future research.

CHAPTER 5

Discussion

This chapter will focus on meanings behind the statistical analyses found in Chapter 4. The chapter is organized by interpretation of the data analyses, followed by implications for future research, practice, education, and policy. Lastly will be study limitations and the chapter summary.

In the prior chapter, the first and second research questions were focused on discovering which risk and protective factors could be used as predictors of the outcomes. The age of the Veteran using home telehealth services for hypertension was a significant, positive predictor of both HT utilization rate and blood pressure target maintenance. The meaning behind this discovery was that as age of the Veteran increases, so does HT utilization rate and blood pressure target maintenance. Chronic conditions also played a role in the multiple regression model for the first research question. However, the role it played was not as strong as that of age.

The thought of older age being a protective factor in HT utilization rate and blood pressure target maintenance may seem somewhat contradictory when considering older age is physiologically a risk factor for high blood pressure (Oliva & Bakris, 2012). As noted prior, age-related BP elevations derive from changes in the atrial structure and function, such as reduced vessel elasticity (Oliva & Bakris, 2012). It is also known that older age leads to cognitive decline (Ryan & Sawin, 2009), yet this study demonstrates that older Veterans tend to follow directions and advice from providers in higher numbers while taking blood pressures at home. There could be several reasons for this, such as older veterans travelling less often or sending daily BP transmissions may be less of a burden for them. None of the studies found in the literature review

used age as a risk and protective factor, only as a demographic variable for groupings. Overall, the multiple regression model predictors age and number of chronic conditions accounted for 15% of the variance found in HT utilization rate, leaving 85% of the variance unexplained, or prediction error. Prediction error is likely to be the sum total of many influences which cannot be accounted for in the data. Increasing the number of predictors could potentially increase the percentage of explained variance.

Several articles in the literature review assigned meaning to demographic variables, suggesting a relationship between social minority status and rates of hypertension. This study did not compare rates of hypertension between races or ethnicities but did find no statistically significant relationships between race/ethnicity and outcomes of HT utilization rate or blood pressure target maintenance. This study had 107 participants and met 80% power, yet it is possible that the sample size may not have been large enough to capture more intricate details in the differences between races/ethnicities and HT utilization rate or BP control.

Another point of interest found in this study was no statistically significant relationship found between the living situations of the Veterans and the outcome goals. Historically, statements made by authors indicate that being married or living with other people are protective factors in making health decisions (Han et al., 2014; Rendell et al., 2011). The study found this to not be the case. Living with a spouse did not promote Veterans to take their own blood pressure and transmit results every day as prescribed. Nor did living with a spouse promote Veterans to maintain blood pressure targets. Much like the predictor race/ethnicity, this could also be a limitation of the sample size not being large enough to capture statistical nuances.

From a self-management point of view, it could be considered somewhat contradictory for the number of diagnosed chronic illnesses and the number of IADL disabilities to have no

statistical significance with the outcomes. It is possible that Veterans with disabilities have assistance at home to manage what they cannot do, which is not captured in the data. Self-management literature suggests that the greater number of chronic illnesses or deficits in IADL ability, the higher the demands of self-management (Ryan & Sawin, 2009; Bokhour et al., 2012; Rajan et al., 2012). According to data analysis, age and number of chronic illnesses had a weak statistically significant relationship. The relationship showed that older Veterans had a higher number of diagnosed chronic illnesses. Yet, older age, which would then have a greater number of diagnosed chronic illnesses, is considered a protective factor and younger age a risk factor. This could be explained by the possibility that, as Veterans gain experience with age, they may develop better self-regulation skills, greater self-confidence, or may be more cognizant of diet, exercise, and healthier lifestyle choices. Also, older Veterans may choose less risky behaviors.

Implications

Research. More research needs to be done on Veteran lifestyle choices in controlling hypertension. Literature suggests that most chronic illnesses have an overlap to some degree with other chronic illnesses. As hypertension is considered a chronic illness, future hypertension research should focus on how it relates to other chronic illnesses along with comorbidities. All chronic illnesses have lifestyle components such as diet and exercise, and hypertension is no different in this regard. Veterans overall had a 64% HT utilization rate but had an 88.8% success rate in blood pressure target maintenance. It is possible that younger Veterans recognize the importance of BP control versus meeting transmission goals. For further SM research specifically, use of a devoted SM theory and process factors could elucidate a great deal of information. The data set used for this study did not have process factors, so a devoted SM

theory was not feasible. However, an example of how the current study would use a devoted SM theory, such as IFSMT (Ryan & Sawin, 2009), is provided (Figure 3).

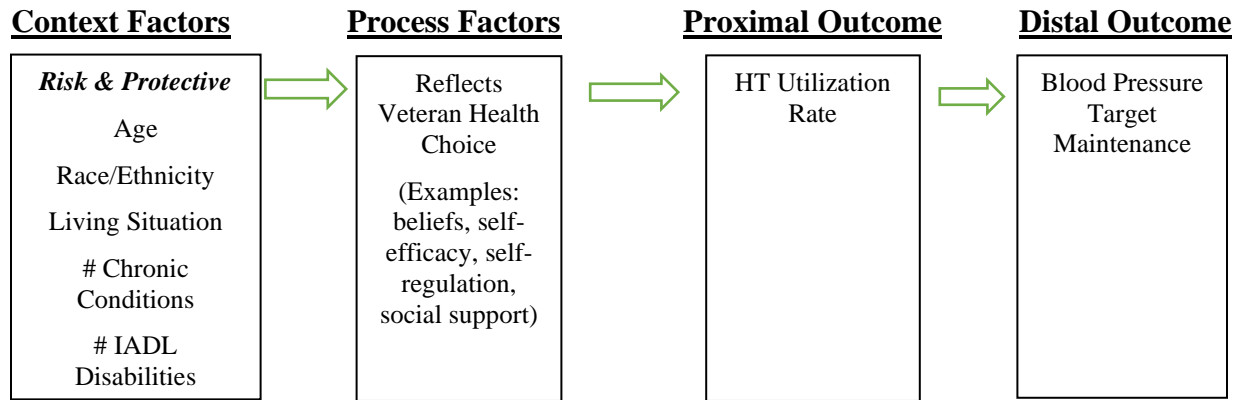


Figure 3
Example of IFSMT for Current Study

Practice. This study has discovered that older age may be a protective factor for Veterans. Veterans who continue to self-manage hypertension through VA home telehealth services may require less intervention on the part of care givers over time. Such an action would allow for focusing interventions toward those who need it more. Also, it could be possible for allow older Veterans who have been successful in the program to have the option of reaching out less. Both stated ideas would create space for others to come into the program, opening precious face to face physician meeting slots for those Veterans in more acute phases of hypertension.

Education. This study indicates that as Veterans use the VA home telehealth services program, there may come a point when they require less intervention. Possible reasons could be development of greater self-efficacy, increased self-regulation, or ease of HT fit into lifestyle. As they age, it seems they understand how to operate the technology and to reach out for assistance when necessary. Telehealth nurses could be taught to look for result trends in making judgement

toward intervention. Nurses could be taught to ask how Veterans are successfully managing daily BP transmission and BP control, to tailor similar training for those having more difficulty.

Nurses should be aware that while some Veterans may feel comfortable reaching out every day, it can be a choice and still achieve the desired outcomes.

Policy. It is currently VA policy to have a 100% daily transmission as a one-size-fits-all approach to Veterans using home telehealth services. This study indicates that HT services could be tailored to allow for Veteran personal preferences as they demonstrate successful blood pressure self-management over time in the program. As an example, study results indicate that all Veterans over 69 years of age met blood pressure target maintenance goals. Therefore, Veterans may not require the same, one-size approach as most are achieving maintenance goals. Older veterans may prefer daily communication. However, it is also possible that younger Veterans may be more comfortable with current technologies rather than those found in this study. Younger Veterans may prefer use of smart phones, or similar mobile technologies with BP management apps. Since they may already be in control of their BP using other devices, they may not concern themselves with older, less convenient methods of tracking. As technologies evolve, so to must HT services to match. Such changes in policy would free precious resources to focus more on those who need direct intervention and introducing more Veterans into the home telehealth program.

Limitations

This study was a secondary analysis of data, which carries inherent limitations. In many forms of secondary research data, it is not specific to the needs of a researcher, and is what it is (McDaniel & Gates, 2008). Also, it has been noted that secondary data tends to be biased in favor of the one who collected it and might not necessarily meet with the requirements of another

researcher (Sparrow, 2012). While this study was large enough to meet 80% power, having a greater number of participants may better elucidate findings that this study may have missed. Other limitations included the need to remove participants due to lacking data values. This study lacked other context variables found in the original data set but were missing values, so could not be used. Those context factors may have significant relationships with outcome variables. From the SM perspective, there were no process factors, making use of a devoted SM theory not feasible. All participants in this study were male, making results difficult to translate to women.

Summary

This current study was a secondary, correlational analysis of data from a primary study at a Midwest medical center. Meaning was assigned to traditionally demographic variables in order to apply a self-management lens. The purpose of this study was to explore whether the risk and protective factors of age, ethnicity/race, marital status, living arrangement, number of diagnosed chronic conditions, and number of instrumental activities of daily living impairments, along with the self-management behavior home telehealth utilization rate, contribute to predicting success in maintaining blood pressure targets by Veterans who are participating in home telehealth services to manage hypertension. Significant relationships were identified between age, number of chronic conditions, and the outcomes of home telehealth utilization rate and blood pressure target maintenance. There was no identified relationship between home telehealth utilization rate and blood pressure target maintenance, meaning that home telehealth utilization rate did not mediate in the relationship between age and blood pressure target maintenance. Older age was identified as a protective factor. Future research should focus on use of a devoted SM theory along with process factors to further elucidate how Veterans are self-managing hypertension and other chronic illnesses.

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APPENDIX A: Evidence Table

Level II Studies

Author/Year	Design/Level	Purpose	SM Context/Process and Sample	Outcomes/Significant Findings
Bosworth, H. B., et al. (2004)	Randomized controlled trial	Randomized controlled trial involving a nurse administered patient-tailored intervention is being conducted to improve blood pressure (BP) control	Medication adherence	At 6-month post-enrollment, individuals receiving the nurse intervention had a greater increase in confidence with following hypertension treatment (P<0.007) than the usual care group
	Level II		Perceived risk of hypertension, memory, literacy, social support, provider relationship, side effects of therapy, pill refill, missed appointments, and health behaviors. 294 veterans with hypertension (average age=63 years; 41% African American)	
Bosworth H. B. et al. (2018)	Randomized controlled trial	Test the theoretical framework underlying a tailored behavioral and educational pharmacist-administered intervention for achieving CVD risk reduction	Medication adherence	Relative to the education control group, the clinical pharmacist specialist-delivered intervention did not show a reduction in CVD risk score at 6 months. Despite increased access to pharmacist resources, no observation of significant improvements in CVD risk for patients randomized to the intervention compared to education control over 12 months. Patient self-efficacy and stroke-specific, health-related quality of life at 6 months did not significantly differ between groups
	Level II		Perceived benefits of CVD risk reduction 428 Veterans, 50% African American, 85% men	
Damush, T. M., et al. (2016)	Randomized pilot trial	Targeted stroke/transient ischemic attack (TIA) survivors to engage in self-management practices to manage secondary stroke risk factors	Condition stability/Factual information/Self-efficacy	For compliance to hypertension medications, the intervention group showed significantly greater odds of compliance post intervention than pre intervention (odds ratio = 3.68 (95% CI = 1.81-7.48). The control group showed no difference in compliance rates from baseline to follow-up
	Level II		174 veterans with an acute stroke or TIA who were randomized to receive either the intervention (n = 87) or attention control program (n = 87)	
Edelman, D., et al. (2010)	Randomized controlled trial	To test the effectiveness of group medical clinics (GMCs) in the management of comorbid diabetes and hypertension	Culture/Outcome expectancy/Self-management groups vs Group Medical Clinics	Mean baseline systolic blood pressure and HbA(1c) level were 152.9 mm Hg (SD, 14.2) and 9.2% (SD, 1.4), respectively
	Level II		239 patients with poorly controlled diabetes (hemoglobin A(1c) [HbA(1c)] level >= 7.5%) and hypertension (systolic blood pressure >140 mm Hg or diastolic blood pressure >90 mm Hg) at 2 VA medical centers	At the end of the study, mean systolic blood pressure improved by 13.7 mm Hg in the GMC group and 6.4 mm Hg in the usual care group (P = 0.011 by linear mixed model), whereas mean HbA(1c) level improved by 0.8% in the GMC group and 0.5% in the usual care group (P = 0.159)
Heisler, M., et al. (2012)	Randomized controlled trial	Examine whether the Adherence and Intensification of Medications intervention (AIM), a pharmacist-led intervention combining elements found in efficacy studies to lower BP, improved BP among patients with diabetes mellitus with persistent hypertension and poor refill adherence or insufficient medication intensification in 2 high-performing health systems.	Condition stability/Factual information/AIM vs usual care	Mean SBP decrease from 6 months before to 6 months after the intervention period was approximate to 9 mm Hg in both arms.
	Level II		Randomization of 16 primary care teams at 5 medical centers (3 Veterans Affairs and 2 Kaiser Permanente)	Mean SBPs of eligible intervention patients were 2.4 mm Hg lower (95% CI: -3.4 to -1.5; P<0.001) immediately after the intervention than those achieved by control patients
Klamerus, M. L., et al. (2014)	Randomized controlled trial	Determine patient characteristics associated with achieving and sustaining blood pressure (BP) targets in the Adherence and Intensification of Medications program	Condition stability/Factual information/AIM program	In multivariable analyses, patients who screened positive for depression or had a higher baseline systolic BP were less likely to achieve short-term success
	Level II		Baseline survey data from 458 program participants were examined to determine patient characteristics associated with (1) discharge from the program with a target BP (short-term success) and (2) maintenance of the target BP over a nine-month period (long-term success)	Patients who reported at baseline one or more barriers to medication adherence were less likely to achieve long-term success Although almost 90% of patients achieved short-term success, only 28% achieved long-term success

Level IV Studies

Author/Year	Design/Level	Purpose	SM Context/Process/Intervention and Sample	Outcomes/Significant Findings
Bowen, M. E., et al. (2013)	Single correlational study Level IV	Hypothesis: patients with greater travel distances would have greater improvements in 18-month systolic blood pressure (SBP)	Health Care Access/Goal setting/Telemedicine Secondary analysis of 503 veterans participating in a hypertension telemedicine study	Compared with patients receiving usual care (UC), distance <30miles (intercept=127.7), no difference in 18-month SBP was observed in patients receiving UC, distance 30 miles (0.13mmHg, 95% confidence interval [-6.6 to 6.8]); telemedicine, distance <30 miles (-1.1mmHg [-7.3 to 5.2]); telemedicine, distance 30miles (-0.80mmHg [-6.6 to 5.1])
Cho, A. H., et al. (2007)	Single correlational study Level IV	Examine patients' perceptions of their providers' participatory decision making (PDM) style and hypertension self-care behaviors and outcomes	Provider Communication/Negotiated collaboration/Telemedicine Presence of a home blood pressure monitor, monitoring frequency, and self-reported antihypertensive medication adherence 554 veterans with hypertension enrolled in the Veterans' Study to Improve the Control of Hypertension	Overall, veterans with hypertension rated providers as highly participatory In adjusted analyses, a lower PDM score was associated with decreased odds of having a home monitor (odds ratio, 0.90 per 10-point decrement in PDM score; 95% confidence interval, 0.83-0.98) but not with monitoring frequency, adherence, or blood pressure control.
Hayes, A., et al. (2010)	Single correlational study Level IV	Describes key features of a peer support program designed to motivate individuals to improve self-management of hypertension	Culture/Social influence/Peer-led education 15 VFW posts and 27 peer leaders	Peer leaders reported that they gained health knowledge, skills, and confidence to perform as informational resources at their posts, resulting in greater levels of health support among post members Peer leaders had a significant drop in BP measurements
Hong, T. B., et al. (2005)	Single correlational study Level IV	The congruence between self-rated health and objective health was examined for associations with health factors related to hypertension (health behaviors, medication barriers, and perceived blood-pressure control)	Complexity of condition/Decision making/Health congruence classification Medication adherence and barriers Perceived blood-pressure control 588 hypertensive veterans (mean age = 63)	Optimists had higher perceived control of their hypertension when compared to pessimists Optimists had higher levels of exercise and fewer medication barriers when compared to poor health realists
Hong, T. B., et al. (2006)	Single correlational study Level IV	Locus of control as a moderator of the relationship between medication barriers (e.g., side-effects, forgetting to take medication, and keeping track of pills) and anti-hypertensive medication adherence was examined	Complexity of condition/Decision making/Locus of control for medication adherence 588 hypertensive veterans (mean age = 63)	Higher internal locus of control was beneficial when barriers to medication adherence are low, but at high perceived barriers, locus of control plays less of a role in medication adherence Black and non-white females have higher rates of self-overreporting of medication adherence
Howell, B. A., et al. (2016)	Single correlational study Level IV	Explore the impact of incarceration on blood pressure (BP) control	Capacity to SM/Goal congruence/Incarceration Sociodemographic characteristics Clinical factors (HIV status and body mass index) Behavioral factors (history of smoking, unhealthy alcohol use, illicit drug use) Goal congruence (post-traumatic stress disorder (PTSD), depression, primary care engagement, and adherence to antihypertensive medications Data from the Veterans Aging Cohort Study (VACS), 2304 participants met the inclusion criteria	Participants with recent or past history of incarceration were more likely to have uncontrolled BP than those without a history of incarceration In multivariable analysis, recent incarceration, but not a past history of incarceration, was associated with uncontrolled BP compared with those who were never incarcerated Results suggest that other mechanisms play a role
Maciejewski, M. L., et al. (2014)	Single correlational study	Examine clinical and economic outcomes 18 months after completion of	Condition stability/Outcome expectancy/Clinical education and SM support	Compared with usual care, patients randomized to the combined arm had greater improvement in proportion of BP control during and after the 18-month trial and estimated proportion of BP control

Author/Year	Design/Level	Purpose	SM Context/Process/Intervention and Sample	Outcomes/Significant Findings
	Level IV	a hypertension self-management trial	591 veterans with hypertension who were randomized to usual care or 1 of 3 interventions	improved 18 months after trial completion for patients in the behavioral and medication management arms Among the patients with inadequate baseline BP control, estimated mean systolic BP was significantly lower in the combined arm as compared with usual care during and after the 18-month trial
Powers, B. J., et al. (2008)	Single correlational study Level IV	Determine whether there is a significant correlation between the perceived and actual stroke risk among hypertensive patients and to identify patient characteristics associated with inaccurate estimation of stroke risk	Complexity of condition/Factual information/Stroke risk 296 men with hypertension who were enrolled in the Veterans Study to Improve the Control of Hypertension (V-STITCH)	There was no significant correlation between patients' perceived risk of stroke and their calculated FSR (Spearman rho=-0.08; P=.16; 95% confidence interval, -0.19 to 0.03) Patients who underestimated their stroke risk were significantly less likely to be worried about their blood pressure than patients with accurate risk perception (12.4% vs 69.6%; P<.0001) Lack of correlation between hypertensive patients' perceived stroke risk and FSR supports the need for better patient education on the risks associated with hypertension Race played a significant role on perceived stroke risk estimation versus the Framingham Stroke Risk questionnaire
Powers, B. J., et al. (2009)	Single correlational study Level IV	Evaluate the effect of a tailored hypertension self-management intervention on the unintended targets of glycosylated hemoglobin (HbA(1c)) and low-density lipoprotein cholesterol (LDL-C)	Complexity of condition/Goal congruence/nurse telephone SM intervention Veterans Study to Improve the Control of Hypertension, comparing changes in HbA(1c) among a subgroup of 216 patients with diabetes and LDL-C among 528 patients with measurements during the study period	For the patients with diabetes, the hypertension self-management intervention resulted in a 0.46% reduction in HbA(1c) over 2 years compared with usual care (95% confidence interval, 0.04%0.89%; P = .03) For LDL-C, there was a minimal 0.9 mg/dL between-group difference that was not statistically significant (95% confidence interval, -7.3-5.6 mg/dL; P = .79) Chronic disease self-management interventions might have "spillover" effects on patients' comorbid chronic conditions
Rittmueller, S. E., et al. (2015)	Single correlational study Level IV	Examine associations between varying levels of alcohol use and self-reported cardiovascular health behaviors among hypertensive Veterans Affairs (VA) outpatients	Health knowledge Health belief Male outpatients with self-reported hypertension from 7 VA sites who returned mailed questionnaires (N = 11,927)	Increasing level of alcohol use was associated with decreasing prevalence of avoiding salt, controlling weight, not smoking, and the combination of all 4 behaviors (P values all <.001) Alcohol consumption is inversely associated with adherence to cardiovascular self-care behaviors among hypertensive VA outpatients
Roumie, C. L., et al. (2011)	Single correlational study Level IV	Evaluate patient centered primary care as a determinant of medication adherence	Medication adherence Provider relations 499 Veteran patients with complete data were analyzed	Antihypertensive adherence increased as scores in patient centered care increased
Schapira, M. M., et al. (2012)	Single correlational study Level IV	The hypertension evaluation of lifestyle and management (HELM) scale was developed as part of a community-based study designed to improve self-management of hypertension.	Complexity of condition/Factual information/HTN knowledge scale 404 Veterans with hypertension	Scores were positively associated with education (0.28, P<.0001), print health literacy (0.21, P<.001), health numeracy (0.17, P<.001), and patient activation (0.12, P=.015) but no association was found with diastolic or systolic blood pressure The HELM knowledge scores increased following the educational intervention from baseline (mean, 8.7; standard deviation, 2.2) to 12-month follow-up (mean, 9.2, standard deviation, 2.2; P<.001)
Shaw, R. and Bosworth, H. B. (2012)	Single correlational study	Identify the feasibility and predictive validity of an easy and quick self-reported measure of	Complexity of condition/Factual information/Baseline medication adherence	Baseline medication non-adherence was associated with a 6-3 mmHg increase in systolic blood pressure (p < 0-05) at baseline, a 8-4 mmHg increase in systolic blood pressure (p <

Author/Year	Design/Level	Purpose	SM Context/Process/Intervention and Sample	Outcomes/Significant Findings
	Level IV	medication adherence and to identify characteristics of people with hypertension that may warrant increase attentiveness by nurses to address hypertensive self-management needs	159 hypertensive patients in two primary care clinics	0.05) at 12 months and a 7.5 increase in systolic blood pressure at 24 months (p < 0.05) compared with adherent patients, respectively Results also indicate a significant increase in systolic blood pressure across 24 months among people who identified as minority and of low financial status Significant increase in systolic BP across 24 months among people who identify as minority status
Shea, K. and B. Chamoff (2012)	Single descriptive and correlational study Level IV	Examine the relationship between communication and information integration into the daily lives of patients with chronic illnesses and offer best practice recommendations for tele-homecare nurses (THN)	Complexity of condition/Self-monitoring/Social relations model 43 patients' and nine THNs' ratings of themselves and each other on communication (frequency, timeliness, and understanding) and the use of patients' daily tele-monitored information	There was almost no correlation between patients' perception of THNs' communication (frequency [r = 0.05], timeliness [r = 0.09], and understandability [r = 0.03]) and patients' integration of information into daily health practices Significant correlations were found between the THNs' perception of patients' communication frequency and timeliness, and integration, (p = 0.02; p < 0.001) respectively
Smith, N. L., et al. (2004).	Single correlational study Level IV	Describe the extent to which hyperglycemia, hypertension, and dyslipidemia are currently detected, treated, and controlled in U.S. Veterans with diabetes with and without ischemic heart disease (IHD)	Self-efficacy 3,769 Veterans who self-reported diabetes and who received all health care from the Veterans Administration (VA) medical centers were selected from subjects enrolled in the Ambulatory Care Quality Improvement Project	Veterans with IHD were more likely to have hypertension (73 vs. 64%), to be treated (88 vs. 78%), and to have optimal blood pressure control (19 vs. 10%) compared with veterans without IHD (all P values <0.01) Veterans with IHD were more likely to have dyslipidemia (81 vs. 53%), were equally likely to be treated (54 vs. 50%), and were more likely to have optimal LDL levels (30 vs. 16%) compared with veterans without IHD, all P values <0.01
Subramanian, U., et al. (2007)	Single correlational study Level IV	Objectives: (1) To determine what proportion of patients with diabetes have BP targets; (2) To determine patient characteristics associated with having a BP target	Complexity of condition/Goal congruence/Setting BP target Cross-sectional, anonymous survey of 500 randomly selected outpatients with hypertension and DM receiving care in any Veterans Health Administration outpatient clinic in 2003	Although most (91%) had blood glucose targets, fewer than 60% reported having a BP target College education was associated with having a BP target (AOR 1.97 [95% CI: 1.16-3.34]) Less than two-thirds of diabetic, hypertensive patients had BP targets
Sussman, J. B., et al. (2012)	Single correlational study Level IV	Determine if hypertension treatment intensification (TI) is more likely in patients with elevated CV risk	Complexity of condition/Outcome expectancy/CV risk vs. BP level for TI Medication adherence Health knowledge 856 US veterans with diabetes and elevated blood pressure (BP)	Individual risk factors were associated with higher rates of TI: systolic BP, mean BP in the prior year, and higher glycated hemoglobin Self-reported home BP <140/90 mm Hg was associated with lower rates of TI
Thorpe, C. T., et al. (2008)	Single correlational study Level IV	Examine the relationship of patient and social environment characteristics to monitor possession and frequency of SBPM	Complexity of condition/Self-monitoring/BP monitor possession Monitor possession SBPM frequency Concurrent blood pressure control Patient demographic, clinical, and psychosocial factors 578 male hypertensive Veterans	Older age, diabetes, unemployment, and better mental health status were related to greater likelihood of monitor possession Monitor possession, having diabetes, being unemployed, and having a shorter duration of hypertension were independently related to greater frequency of SBPM Monitor possession, but not frequency of SBPM, was related to a decreased likelihood of blood pressure control in adjusted analyses. Older, female, higher socioeconomic status, and diagnosed with diabetes had the highest odds of owning a home BP monitor
Wakefield, B. J., et al. (2011)	Single correlational study	Evaluate the efficacy of a nurse-managed home telehealth intervention to	Health knowledge Self-efficacy Medication adherence	For SBP, the high-intensity subjects had a significant decrease in SBP compared with the

Author/Year	Design/Level	Purpose	SM Context/Process/Intervention and Sample	Outcomes/Significant Findings
	Level IV	improve outcomes in Veterans with comorbid diabetes and HTN	A single-center randomized controlled clinical trial design compared in-home monitoring (n=55) and usual care (n=53) in patients with type 2 diabetes and hypertension being treated in primary care clinics	<p>other groups at 6 months and this pattern was maintained at 12 months</p> <p>Knowledge scores improved in the high-intensity intervention group participants, but upon further analysis, it was found the intervention effect was not mediated by gain in knowledge</p> <p>No significant differences were found across the groups in self-efficacy, adherence, or patient perceptions of the intervention mode</p>
Wang, P. S., et al. (2004)	Single correlational study	Address poor patient compliance with antihypertensives, clinicians and researchers need accurate measures of adherence with prescribed regimens	Complexity of condition/Self-evaluation/record of filled medication prescriptions	There was very poor agreement between self-reported compliance and days actually covered by filled prescriptions (Spearman correlation coefficient = 0.15; 95% CI: 0.01, 0.28)
	Level IV		200 hypertensive patients treated with a single antihypertensive agent in a large health maintenance organization (HMO) or a Veterans Affairs medical center (VAMC)	<p>Very poor agreement was observed between a categorical measure of self-reported compliance (ever vs. never missing a dose) and categories of actual compliance defined by filled prescriptions (< 80% vs > 80% of days covered; kappa = 0.12, 95% CI: -0.02, 0.26)</p> <p>Compliance was markedly overstated in this sample of patients and few characteristics identified those who reported more versus less accurately</p>
Weidenbacher, H. J., et al. (2015)	Single correlational study	Persons with depressive symptoms generally have higher rates of medication nonadherence than persons without depressive symptoms. However, little is known about whether this association differs by comorbid medical condition or whether reasons for nonadherence differ by depressive symptoms or comorbid medical condition	Complexity of condition/Goal congruence/medication adherence in depressive Veterans	The odds of nonadherence were higher among participants with high depressive symptom burden for dyslipidemia, but not hypertension or type 2 diabetes
	Level IV		1,026 Veterans prescribed medications for hypertension, dyslipidemia, and/or type 2 diabetes	Among participants reporting nonadherence to antihypertensive and antilipemic medications, those with greater depressive symptom burden had greater odds of endorsing medication nonadherence reasons related to negative expectations and excessive economic burden
Zikmund-Fisher, B. J., et al. (2009)	Single correlational study	Explore covariates of Veteran patient attitudes regarding medication intensification	Complexity of condition/Decision making/medication intensification	While 64% of participants reported complete willingness to intensify BP medications, 36% of participants expressed at least some unwillingness
	Level IV		<p>Medication adherence regarding: BP control (actual and perceived) Perceived importance of BP control BP management self-efficacy Goal congruence Trust in provider Sociodemographic factors</p> <p>1,062 Veteran diabetics identified as having BP ≥ 140/90 mm Hg as part of a prospective cohort study of clinical inertia in hypertension treatment</p>	<p>Willingness to intensify was negatively associated with medication concerns, particularly concern about side effects and adherence or management problems, and positively associated with perceived dependence of health on BP medications and trust in provider</p> <p>Importance of BP control had a weaker, non-significant association with willingness to intensify</p> <p>Neither competing demands, current BP control, current number of medications prescribed, nor self-efficacy was associated with willingness to intensify medications</p>

Level VI Studies

Author/Year	Design/Level	Purpose	SM Context/Process and Sample	Outcomes/Significant Findings
Bokhour, B. G., et al. (2012)	Single qualitative study Level VI	Explore how patients' "explanatory models" of hypertension (understandings of the causes, mechanisms or pathophysiology, course of illness, symptoms and effects of treatment) and social context relate to their reported daily hypertension self-management behaviors	Perceptions Experiences Health beliefs African-American, White, and Latino Veterans Affairs (VA) primary care patients with uncontrolled blood pressure	Patients' perceptions of the cause and course of hypertension, experiences of hypertension symptoms, and beliefs about the effectiveness of treatment were related to different hypertension self-management behaviors Patients' daily-lived experiences, such as: isolated lifestyle, serious competing health problems, a lack of habits and routines, barriers to exercise and prioritizing lifestyle choices, also interfered with optimal hypertension self-management
Bokhour, B. G., et al. (2016)	Single qualitative study Level VI	Assess the impact of viewing African-American patients' stories of successfully controlling hypertension on intention to change hypertension management behaviors and engagement with educational materials.	Behavior change intention and engagement 618 African-American Veterans with uncontrolled hypertension viewed an information-only DVD about hypertension (control) or a DVD adding videos of African-American Veterans telling stories about successful hypertension management (intervention). After viewing, patients were asked about their engagement with the DVD, and their intentions to change behavior	Results favored the stories intervention with significantly higher emotional engagement versus control, become more physically active, use of salt substitutes, talk openly with their doctor about hypertension, and remember to take hypertension medication Patients were more emotionally engaged and reported intentions to change behavior when watching real patient hypertension management success stories
Mosack, K. E., et al. (2012)	Single qualitative study Level VI	Determine the influence of program factors on participant engagement in POWER, a peer-led intervention designed to reduce hypertension, increase hypertension knowledge, and improve other relevant health behaviors, such as diet and exercise, among US veterans involved in Veterans service organizations throughout Southeastern Wisconsin	Culture/Social influence/POWER 219 hypertensive members from 58 VSOs participated in a year-long peer-led intervention designed to improve hypertension knowledge, disease self-management behaviors, and health outcomes	HTN cause: heredity, general life stress, poor diet (especially salt intake), and lack of exercise Course of illness: HTN seen as an intermittent problem, no constant management required Symptoms: Ranging from none to dizziness Treatment: taking medications, diet, and exercise to relaxation as treatment Daily lived experiences: lonely/isolated lifestyle, competing health problems, lack of habits and routines, and prioritizing lifestyle choices Peer leaders had a significant drop in BP measurements

APPENDIX B: IRB Approval



Leah Stoiber
IRB Administrator
Institutional Review Board
Engelmann 270
P. O. Box 413
Milwaukee, WI 53201-0413
(414) 229-7455 *phone*
(414) 229-6729 *fax*

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New Study - Notice of IRB Exempt Status

Date: August 19, 2019

To: Rachel Schiffman, PhD
Dept: College of Nursing

CC: Vincent Boom

IRB#: 20.028

Title: FACTORS AFFECTING BLOOD PRESSURE TARGET OUTCOMES FOR VETERANS USING HOME TELEHEALTH

After review of your research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol has been granted Exempt Status under **Category 4** as governed by 45 CFR 46.104 (d). Your protocol has also been granted approval to waive informed consent as governed by 45 CFR 46.116 (f) for use of existing records.

This protocol has been approved as exempt for three years and IRB approval will expire on **August 18, 2022**. If you plan to continue any research related activities (e.g., enrollment of subjects, study interventions, data analysis, etc.) past the date of IRB expiration, please respond to the IRB's status request that will be sent by email approximately two weeks before the expiration date. If the study is closed or completed before the IRB expiration date, you may notify the IRB by sending an email to irbinfo@uwm.edu with the study number and the status, so we can keep our study records accurate.

Any proposed changes to the protocol must be reviewed by the IRB before implementation, unless the change is specifically necessary to eliminate apparent immediate hazards to the subjects. The principal investigator is responsible for adhering to the policies and guidelines set forth by the UWM IRB, maintaining proper documentation of study records and promptly reporting to the IRB any adverse events which require reporting. The principal investigator is also responsible for ensuring that all study staff receive appropriate training in the ethical guidelines of conducting human subjects research.

As Principal Investigator, it is also your responsibility to adhere to UWM and UW System Policies, and any applicable state and federal laws governing activities which are independent of IRB review/approval (e.g., [FERPA](#), [Radiation Safety](#), [UWM Data Security](#), [UW System policy on Prizes, Awards and Gifts](#), state gambling laws, etc.). When conducting research at institutions outside of UWM, be sure to obtain permission and/or approval as required by their policies.

Contact the IRB office if you have any further questions. Thank you for your cooperation, and best wishes for a successful project.

Respectfully,

Leah Stoiber
IRB Administrator

APPENDIX C: Curriculum Vitae

Vincent Boom

Place of birth: Mason City, Iowa

Education

ADN, Cardinal Stritch University, December 2009

Major: Nursing

BSN, Chamberlain College of Nursing, May 2011

Major: Nursing

Dissertation Title: Factors Affecting Blood Pressure Target Outcomes for Veterans Using Home Telehealth

Hagle, M., Boom, V., Mancuso, J., Tennes, S., Mikell, M., Hughes, R., & Wakefield, B. (March 2016). Utilization of home telehealth by Veterans with hypertension: Achievement of BP goals. 40th Annual Midwest Nursing Research Society Conference, Milwaukee, WI. Refereed paper presentation.