BELIEFS AND FACTORS THAT INFLUENCE INTENTIONS TO INITIATE ANTIHYPERTENSIVE MEDICATIONS

A Thesis

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Omokhodion (Alfred) Eriakha

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ABSTRACT

Background: Primary nonadherence (PMN) to antihypertensives constitutes a problem for all stakeholders regardless of whose perspective is taken. Understanding patient beliefs and utilizing a theory could help move the needle in favor of antihypertensive medications initiation.

Objectives: To determine the predictive ability of an integrated model of the theory of planned behavior and health belief model on intention to initiate an antihypertensive medication and to rank the identified factors of intentions to initiate antihypertensive medications in order of relative importance.

Methods: A cross-sectional survey was conducted to evaluate beliefs and factors that determine intention to initiate antihypertensive medications. The sample was sourced from a national online panel provided by Qualtrics. Bivariate analysis was conducted to determine the relationships among the constructs, as well as between each construct and intentions. Multivariable analysis was also carried out, controlling for potential confounders. To ascertain which construct was most important in predicting intention, relative weight analysis was used.

Results: A total of 941 participants took part in the study with an average age of 41.3 years and a standard deviation of 14.8 years. Model 1 comprising of twelve predictors accounted for 8% (R2 = 0.08) of the variation in intention. Model 2 incorporated an additional seven variables for a total of nineteen predictors. This model explained an additional 65% (R2 = 0.65) of the variation in intention resulting in a total variance explained of 73% (R2 = 0.73). Overall, Attitude, Subjective norm, Perceived behavioral control, and Perceived severity had a positive significant relationship with the intention to initiate antihypertensive medications while Perceived barrier

had a negative significant relationship. However, the relationship for perceived benefits as well as perceived susceptibility was not statistically significant. The results of the relative weight analysis indicates that the most important variables in predicting intention to initiate antihypertensive medications are Subjective Norm (RW = 0.22 or 30.84% of the explained variance), Perceived Behavioral Control (RW = 0.19 or 26.04% of the explained variance), and Attitude (RW = 0.13 or 17.17% of the explained variance).

Conclusion: One of the recommendations by the World Health Organization (WHO) for addressing medication nonadherence is a tailored intervention approach. Amid scarce resources, targeting interventions towards factors deemed most important could result in tremendous cost savings for all stakeholders. This cost saving would be achieved through decreased healthcare costs from preventable hospitalizations and waste, increased patient quality of life, increased productivity and a resultant improvement in health economics and outcomes.

DEDICATION

This thesis is dedicated to my beloved parents and brothers, who I cherish so much.

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My deepest appreciation goes to my committee chair, Dr. Erin Holmes. Thank you so much for your support, for your guidance, for your words of encouragement, for your words of motivation and above all for being my ‘friend’. The opportunity to work with and learn from you has been a relaxed, fun, invaluable, and exciting experience for me.

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CHAPTER I: INTRODUCTION

INTRODUCTION

The concept of 'medication nonadherence' constitutes a pernicious problem for stakeholders regardless of whose perspective is taken — government, payer, patients, or the healthcare system[1]. It is defined as the extent to which a person's medication taking behavior deviates from agreed recommendations from a healthcare provider[1]. It can be split into two categories, secondary nonadherence and primary nonadherence[1]. Secondary non-adherence results when patients do not obtain refills or miss doses of their medications while primary non-adherence occurs when patients do not fill, redeem, or take their medications within a specified period after they are prescribed[2–7]. Although both adherence categories hold tremendous importance in the treatment of chronic conditions, it could be argued that the initiation of medications, which is the first phase of medication adherence by patients, holds the greatest importance. This is because this phase is what sets the stage for patients' long-term adherence to medicines for chronic conditions. Therefore, it is important to determine not just how external factors affect medication initiation but how beliefs of patients affect it. As a result, interventions can be targeted toward these beliefs to change them favorably with the aim of improving healthcare value — reducing health care costs while improving healthcare outcomes. However, compared with secondary nonadherence, primary nonadherence (PMN) has been given less priority and is a less studied form of nonadherence[8,9]. Its actual prevalence, which has been found to range between 1.94 to 75 percent, has been difficult to establish as different studies have utilized varying definitions, timelines and methods in its measurement and calculation[3,10]. It is affected by several factors which includes socioeconomic, patient, provider, prescription, and disease factors[11] and has been

investigated in various disease areas such as dermatology[12], oncology[10], arthritis[13], and cardiovascular conditions[14].

Examining non-initiation of medications meant for cardiovascular conditions such as hypertension potentially constitutes an interesting investigation due to the non-symptomatic nature that characterizes these conditions. More so, hypertension is highly prevalent and poses significant cost to the government, payers, healthcare system, and patients[15]. In addition to its effect on economic outcomes, it also affects patients' clinical as well as humanistic outcomes. A 2020 ranking conducted by Murphy et al., which is also available on the website of the Center for Disease Control (CDC) places heart disease (which encompasses hypertension) as the leading cause of death in the United States[16,17]. An active initiation of medications meant to treat this condition by patients might help prevent premature deaths, improve their quality of life, decrease healthcare utilization, and save a significant amount of costs for stakeholders. Therefore, it is important to determine factors which are most important in influencing antihypertensive medications initiation to tailor necessary interventions which could help improve them. A few studies have sought to determine these factors. However, most of the studies which have been conducted to date have taken an atheoretical approach. But the literature suggests that utilizing theory can help in better understanding the relationships of interest as well as improving generalizability[18]. Additionally, literature also suggests that an integration of theories might be better at improving outcomes as each theory addresses the limitations of the other in explaining variability in the outcome of interest[19–21]. Therefore, this study seeks to utilize an integrated model of the theory of planned behavior and health belief model in determining factors and beliefs which hold the most importance in predicting intentions to initiate antihypertensive medications.

CHAPTER II: LITERATURE REVIEW

LITERATURE REVIEW

The problem of medication nonadherence

In 2003, the World Health Organization (WHO) published a report reviewing known facts about adherence to medications for chronic conditions and also, to provide necessary information to relevant stakeholders that will foster policy changes to address this pertinent problem[1]. The report advocated for implementation of what is already known as well as a multidisciplinary and systems approach to dealing with medication nonadherence[1]. The estimated nonadherence rate to chronic conditions in developed countries at the time was fifty percent, and much more in developing countries[1]. Two decades later, the problem of medication nonadherence still persists — its effects being very evident based on empirical statistics such as health care outcomes, healthcare costs and healthcare utilization in different disease areas[1,22–27]. Possible reasons are numerous and range from non-implementation of available knowledge[1,28], increase in the number of people affected by chronic conditions[1] or even a facile knowledge base on which interventions such as communication efforts are based[1]. Supporting this, Patton et al. — in a review of studies on interventions meant to improve medication adherence and which utilized a theory in their development — found that theories were not properly or adequately utilized in designing these interventions[29].

Adherence is defined as 'the extent to which a person's behavior – taking medications, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a

health care provider'[1]. Poor adherence to medications is an issue of public health concern — as it affects not only patients health outcomes, but also healthcare utilization and costs[1,22–25]. According to the New England Healthcare Institute, the cost of medication nonadherence to the healthcare system has been estimated at $290 billion yearly and a systematic review by Cutler et al. placed the per person estimated cost of disease specific non-adherence between $949 and $44,190[27,30]. Adequate medication adherence is crucial as it has several advantages not just for the individual patient — an improvement in health outcomes — but also for the healthcare system — a reduction in cost[23,24,27,31–34].

Factors associated with poor adherence to medications

Several factors contribute to the preponderance of medication non-adherence ranging from socioeconomic to healthcare related, condition related, therapy related and patient related factors[1]. Each one of these factors have to be intervened on for there to be an improvement in adherence[1]. Interventions which have been proposed and utilized for improving medication adherence includes education, counseling, reminders, behavioral interventions, and follow-up calls[1,35]. According to the World Health Organization (WHO), an improvement in the effectiveness of interventions tailored towards improving adherence would have a tremendous impact on population health; an impact which has been estimated to provide substantial benefit much more than any specific medical treatment can provide[1]. Therefore, adequate design and implementation of interventions based on rigorous research should be a priority.

Categories of medication nonadherence

The literature conceptualizes three categories of medication nonadherence. One, is when the initial prescription is not redeemed by the patient referred to as primary nonadherence; two, is

when patients do not obtain refills for their medications; and three is when patients miss doses of their medications[5–7]. Categories two and three are conceptualized as secondary non-adherence[2]. Nonadherence could also be active or passive. Active nonadherence is very much relevant for 'silent conditions' such as hypertension and hypercholesterolemia. Since these conditions are asymptomatic, patients are less likely to see the need to initiate, or continue taking medications, if it has already been initiated[36,37]. These categories of nonadherence are all different events spurred on by different beliefs and factors and as such will require different intervention approaches[38].

Challenges with medication adherence research

Two challenging aspects of the medication adherence concept is its definition as well as its measurement[8]. Different methods have been utilized in assessing adherence from direct methods such as biological assays to indirect methods such as self-reports, pill counts and claims data[1]. Depending on the method employed, limitations abound[1]. This is even more germane to the first nonadherence category — primary nonadherence[3].

Primary nonadherence

Definition

Primary nonadherence (PMN) occurs when patients do not fill, redeem, or take their medications within a specified period of time after they are prescribed[2–4]. Compared with secondary non-adherence, primary non-adherence is a less studied type of medication non-adherence[8,9]. The available studies which have been conducted on primary nonadherence have utilized different definitions and time periods in its assessment[3]. Some studies have classified unfilled prescriptions under primary nonadherence by utilizing time periods varying from 48 hours to 12

months after the new prescription was issued[3,7,39]. The definition of 'new prescription' also varies for different studies. For some, regardless of previous medication history, medications, for which prescriptions were not available within 6 to 24 months prior to the index date were classified as new prescriptions[3,39]. In addition to the variations in its definition and classification, inconsistencies exist in the terminologies which have been utilized as well.

Terminologies utilized

Different studies have utilized different terminologies in capturing the concept of 'primary non-adherence'. Although, most studies have utilized the terms 'primary non-adherence'[5,39–57], 'primary medication non-adherence'[58–60], or 'primary adherence'[61], other terminologies which have been employed includes 'prescription abandonment'[62–64], 'prescription non-fulfillment'[65], 'primary prescription noncompliance'[66], 'unfilled prescription'[67,68], and 'first-fill adherence'[69,70].

Prevalence and measurement of primary nonadherence

As was previously stated, most of the literature on adherence has been on secondary nonadherence — with primary nonadherence given less priority[8,9]. Why has this been the case? A plausible explanation for this trend might be the difficulties inherent in measuring or assessing this arcane concept. Methods which have been employed in its measurement includes self-report using questionnaires and interviews and more recently, a linkage of electronic health records and claims data[3,40,41,54]. Hence, there have been variations in the rates of primary nonadherence provided by different studies and this has been found to range from 1.94 to 75%[3,5,7,10,39,53,56,71–76]. These variations have made it difficult to determine its actual rate. The varying rates could be attributed to the condition under study, the different definitions and timelines utilized as well as the different methods employed in its calculation or measurement[3,11,72,77]. In addition to the

variegation in the concept's prevalence, measurement, terminologies, and definitions, it is also affected by a mix of factors.

Factors associated with primary nonadherence

Several factors and reasons have been proposed for primary nonadherence. These includes issues with transportation, satisfaction with the healthcare system, trust in the healthcare provider, cost of medications, lack of social support, number of medications, patient characteristics, patient comorbidities, medication class, low perception of medication necessity or need, high perception of concern about medication use, satisfaction with the healthcare system and beliefs about the condition[7,38,60,72,78–84]. The WHO divided factors which affects general adherence into five dimensions — patient related, therapy related, condition related, health care system and socioeconomic factors[1]. The factors which affect primary nonadherence can also be placed into different categories such as provider, prescription, patient, system and socioeconomic factors[11].

Socioeconomic factors

An esteemed economist (Victor Fuchs) proposed that human wants are unlimited and the resources available to meet these needs are limited[85]. These available resources also have alternative uses. Hence, consumers must set priorities. For individuals with low socioeconomic status, other competing priorities might be placed above procuring medications — especially if such medications are perceived to be expensive. Socioeconomic factors which have been found to be associated with primary nonadherence includes financial constraint[41,47,60,78,86,87], pharmacy neighborhood household income[59], and socioeconomic status[57].

Patient factors

Patient factors encompass both patient-related and condition-related factors. These include patient demographics, beliefs, attitudes, and intentions. Patient factors which have been found to be associated with primary nonadherence includes age[40,41,44,51,60,75,76,86,88,89], race[53,60,75,88,89], language[88], health literacy[43,47,90], comorbidities[44,89], medication concerns[47,79], side effects fears[47,79,90,91], lifestyle changes[47,90], medication necessity[47], healthcare provider trust[60,91], patient diagnosis[41,53,76], gender[40,75,76], marital status[78], healthcare satisfaction[60], and beliefs about condition[79].

Provider factors

Healthcare providers comprise of physicians, nurses, pharmacists, and other members of the healthcare team. Healthcare-provider factors which have been found to be associated with primary nonadherence include inadequate communication[47,90,91], counseling[86], prescriber specialty[51,59,76], physician medicalization concerns[91], and prescriber practice experience[51].

Prescription factors

Prescription factors comprises of therapy-related factors. Prescription factors which have been found to be associated with primary nonadherence includes type of prescription (electronic or paper)[88], number of prescriptions or medications[41,44,59,78,88,89,91], leftover medications[47,87], medication costs[59,79,91], and medication class[40,53,73].

System factors

System factors comprises factors related to the healthcare system. System factors which have been found to be associated with primary nonadherence includes nursing home discharge[46], pharmacy prescription volume[59], and insurance type[89].

Primary nonadherence disease areas

Available studies on primary nonadherence have investigated different medication classes and disease areas such as dermatology[12], analgesics[92], antibiotics[92], allergies[93], mental health[94], oncology[10], osteoporosis[48,79], rheumatoid arthritis[13] and cardiovascular conditions[14]. Cardiovascular conditions such as hypertension and hypercholesterolemia are interesting from a primary nonadherence standpoint because these are 'silent conditions.' Without the necessary 'cue to action' epitomized by symptoms, patients might err on the side of active non-initiation of medications even when prescribed. Also, these conditions have a high prevalence and if unmanaged could result in serious consequences such as ischemic heart disease, a myocardial infarction or a stroke[15,95–97]. In addition to patient outcomes, unmanaged high blood pressure also places a significant burden on the health care system and societies. For instance, each year, the United States (US) spends $131 billion on the management of hypertension and its complications[15]. According to the CDC, about 34 million US adults with hypertension and who have been provided with a recommendation to start taking antihypertensive medications need to obtain a prescription, in addition to needing to initiate these medications[15]. There are a number of benefits which patients stands to gain from initiation of antihypertensive therapies which extends from preservation of functions of the heart to the brain, eyes and kidneys[98,99].

Few studies have been conducted on primary nonadherence to antihypertensives. In 2008, Mazor et al. determined factors which predict intentions to initiate antihypertensive medications among participants in central Massachusetts[100]. In 2009, Shah et al. conducted a study to determine the factors which predicts initiation of antihypertensive therapy among patients with hypertension[70]. In 2012, Raebel et al. determined the characteristics of patients who are primarily non adherent to antihypertensive medications[73]. In 2014, Polinski et al. identified barriers that prevent patients from initiating antihypertensive medications[91]. Still in 2014, Fischer et al. determined the effectiveness of interventions aimed at reducing primary nonadherence to cardiovascular medications[14]. In 2015 comer et al. investigated the rate as well as factors which influences primary nonadherence to antihypertensives[101] and in 2017, Kerner et al. determined the effectiveness of a reminder intervention aimed at improving primary nonadherence to antihypertensive medications[102]. It is important to note that none of the highlighted studies assessed factors deemed to be most important in predicting primary nonadherence to antihypertensive medications. Also, the approach taken by each of the studies has been atheoretical — as none of them utilized an individual, ecological nor social cognition theory.

Challenges with primary nonadherence research

One of the fundamental issues in the conduct of research geared towards primary nonadherence as has been highlighted is its measurement. However, with the advent of the ability to link electronic health records and pharmacy claims data, primary nonadherence research is starting to burgeon[2,3]. Yet, this new development is no 'panacea.' First, for studies utilizing these linked databases, prescriptions that are not prescribed electronically such as paper prescriptions will most likely be neglected[3]. Second, linkage of these data sources is not always possible due to issues with data access. Therefore, most primary nonadherence studies have been conducted

within institutions and locations with access to patient electronic health records and with such linkage. Potential drawbacks of this are its effect on the external validity of findings from these studies as well as issues that could arise from misclassification bias — filling prescriptions at a different pharmacy and payment in cash (out of pocket). Also, patients who are provided with sample medications by physicians may exhibit delays in prescription filling and may be classified as primarily nonadherent[3]. Furthermore, assessment of beliefs and perceptions of patients and their association with medication non-initiation will not be possible using secondary databases. In addition, the assumption of database linked primary nonadherence research is that prescription filling equals medication consumption. However, this is not always the case. Hence, based on the foregoing, it becomes clear that interaction with patients or participants is required either in the form of surveys or interviews. Yet, a drawback to a patient interaction approach is the potential for social desirability and recall bias and issues with external validity which characterizes self-reported research and surveys respectively. In situations such as this, an approach to consider is the use of a scenario-based experiment — vignettes.

The Vignettes approach

Atzmuller and Steiner defines vignettes as 'a short carefully constructed description of a person, object or situation, representing a systematic combination of characteristics'[103]. Alexander and Becker defines vignettes as a 'systemically elaborated descriptions of concrete situations'[104]. Janet Finch describes vignettes as 'short stories about hypothetical characters in specified circumstances, to whose situation the interviewee is invited to respond'[105]. Vignettes may or may not include manipulations. Vignette approaches with manipulations are referred to as factorial survey experiments[106]. Two types of factorial survey experiment studies exist — paper people studies and conjoint analysis studies[107].

One of the major drawbacks or limitations of self-reported data obtained using questionnaires and interviews as has been highlighted is the likelihood of social desirability bias from respondents which affects the validity and reliability of results obtained using these approaches[104,106]. This is even more pertinent for research on intentions, attitudes, behaviors and beliefs[104]. Beliefs and attitudinal surveys designed using vignettes aids in achieving improved validity and reliability compared with non-vignette surveys[104,106]. This is because when respondents are being asked to imagine a hypothetical scenario, a measure of distance is created between the actual participants and the imagined scenario, hence, there is no incentive to bias their responses[104,105]. This also makes vignettes very amenable to the study of sensitive topics and topics which could be confounded by past or personal experiences in survey research or interviews[105,106]. Another very important attribute of the vignette approach to survey research is it gives the researcher the ability to vary factors considered most important, then randomly assign participants to assess the different varied factors[104]. Therefore, if a change in a vignette factor or manipulation results in a change in respondent beliefs and attitudes, this could help in establishing causality similar to an experimental design[104,106]. Despite these advantages to the use of vignettes in survey research, caution should be employed in their construction[105]. This is to ensure that they are not overly complex and difficult for participants to understand[105]. In addition, they are only hypothetical and not real scenarios[106]. Hence, caution has to be exercised in extrapolating the results of vignettes surveys to real situations[106].

This study in contrast with a factorial survey experiment would aim to take advantage of the imaginative capabilities of vignettes by providing a hypothetical scenario to respondents without manipulating any of the factors presented. This is in a bid to assess the seemingly difficult to assess concept of ‘primary nonadherence’. This, combined with the utilization of a panel —

which comprises varied samples of respondents in their natural environment — will aid in improving external validity or generalizability.

Theory and beliefs

Most of the literature on primary nonadherence has sought to identify the characteristics of the prescriber, prescription, and patients which influence primary nonadherence, presumably because they are easier to measure. However, these characteristics, even when identified, are not modifiable[108]. Also, the number of studies which have employed theories in explaining primary medication nonadherence are a few to none, resulting in difficulties in adequately explaining certain relationships[108]. Understanding patient beliefs and utilizing a theory are important because one, beliefs are modifiable[109] and two, utilizing a theory aids in achieving generalizability and a better understanding of the relationship among constructs[18]. In addition, they could help provide better insight into the behavior under investigation and could serve as templates in the development of interventions to change these behaviors, with the assurance that these interventions, when implemented, would be effective[110]. Examples of theories which have been employed as frameworks within socio-behavioral research include the health belief model, the theory of reasoned action, the theory of planned behavior and the Anderson behavioral model of healthcare utilization. This study will focus on two frameworks — the Health Belief Model and the Theory of Planned Behavior.

The Theory of Planned Behavior

The Theory of Planned Behavior (TPB) rests on the premise that the most fundamental determinant of a behavior is the intention to carry out that behavior[111]. Intention is itself determined by three constructs — attitude towards the behavior, subjective norm and perceived

behavioral control[111]. Attitude concerns the general perception or beliefs individuals have about the outcome of carrying out a behavior as well as their evaluation of those outcomes which can either be positive or negative[112]. Subjective norm concerns how much the conduct of a behavior is influenced by important others[111]. Perceived behavioral control concerns the perception or beliefs individuals have about their ability to perform a behavior[111]. The theory has been widely used although criticized for not accounting adequately for affective constructs as well as the perceived threat of a condition[112].

The Health Belief Model

The health belief model is comprised of outcome specific constructs — perceived susceptibility and perceived severity; behavior specific constructs — perceived benefits and perceived barriers; cues to action and self efficacy[113]. According to the model, individuals will be more likely to engage in a behavior if they have a high perception of susceptibility, severity and benefits of its outcome in addition to having a low perception of barriers towards engagement[113]. The model also includes cues to action (external or internal) which could serve as a source of motivation[111]. Just like the theory of planned behavior, the health belief model has also been criticized for not including a social construct even though this has been found to have an impact on intention and behaviors[114–116].

The paucity of primary nonadherence studies on hypertension which utilized a theory or framework has already been highlighted. In the next section, the study rationale, I would provide justification for the use of these frameworks — the theory of planned behavior and health belief model — and more importantly why a comparison or an integration of both models is necessary. In addition, I would provide justification for the use of relative weights in determining the most important predictors of intention to initiate antihypertensive medications.

Study rationale

At the end of the WHOs disease specific review of hypertension, a list of items, which could help improve adherence to antihypertensive medications, for future research were highlighted[1]. Studies have been conducted to address these areas on general nonadherence but relatively few studies have been conducted on primary nonadherence. The area which this study will seek to address is the determination of theoretically grounded factors and beliefs associated with primary nonadherence to antihypertensive medications.

There are numerous theories available for studying health behaviors and some of the constructs from these different health behavior research theories show certain level of similarities but with different terminologies utilized[110,116,117]. For instance, the perceived benefits and perceived barriers construct from the health belief model, the attitudes construct from the theory of reasoned action and pros and cons from the transtheoretical model have been shown to be similar in some studies but different in others[118,119]. Also, the perceived behavioral control construct from the theory of planned behavior may show similarities to the self-efficacy construct from the health belief model[120]. It is advantageous for researchers to have multiple theories to choose from. However, the researcher's quandary arises when there is a need to pick the best fit for a particular situation. Because some of these theories contain similar constructs, determining what theory to utilize or which would be more effective in tailoring interventions to a specific behavior presents a challenge. One of the recommendations by Weinstein, for moving the field of health behavior research forward and to enhance knowledge contributions is to conduct theory comparisons[110,116]. This is to determine more accurate or precise theories and more influential constructs that pertains to certain health behaviors[110,116]. In addition, some studies have suggested theory modification such as the modification of the health belief model for instance, to

include a social and an intention construct[108,116,117] and others have incorporated the intention construct and found an improved predictive ability of the model[112,114,121]. Even better, some other studies show that an integration of models such as the theory of reasoned action, theory of planned behavior, and health belief model could improve prediction of outcomes such as intention[19,20]. Gerend and Shepherd found utility of an integrated model of the theory of planned behavior and the health belief model in predicting intention to uptake the Human Papillomavirus Vaccine among young women[117]. Fishbein in a study examining the role of theory in HIV prevention integrated the different theories (the health belief model, theory of planned behavior and theory of reasoned action) into one — the integrated behavioral model (IBM)[21]. Prior to that, an integrated model of the health belief model and theory of reasoned action had been examined by Ried et al. among hypertensive patients[122] and patients with urinary tract infection[114]. However, in addition to the theory of reasoned action being used and not the theory of planned behavior, the model by Ried et al. was used in examining compliance and not initiation. Also the study in hypertensive patients was conducted among 300 male veterans which poses issues with generalizability[122]. Hence, the theory of planned behavior will be utilized in this study due to its ability to account for factors which could affect intentions, but which are outside the volitional control of the individual[111]. In addition to determining the predictive abilities of these constructs, they will also be ranked in order of relative importance. This is to facilitate tailoring 'limited' resources towards factors which are deemed most important to help improve them. Several metrics have been and are still being used in determining factors which are most important in accounting for variance in an outcome[123]. These include standardized regression coefficients, zero order correlations, product measures, relative weight, and dominance weight[123,124]. Each metric could be advantageous in some situations but could have drawbacks in others. For

instance standardized regression coefficients are desirable due to their ease of computation, however, they fail to account for the effect of non-orthogonality among variables — which is usually the case within socio-behavioral research[123,124]. Hence, in such situations, relative and dominance weights are preferred because they take into account not just the unique variance of predictors but also their shared variance[124,125]. In fact, a Monte Carlo simulation conducted by LeBreton et al. to compare the effectiveness of several metrics of relative importance showed that relative and dominance weights outperformed the rest but performed relatively equally in the presence of multiple correlated predictors[126]. Therefore, it is against this background that this study would aim to utilize relative weights in determining which constructs from an integrated model of the theory of planned behavior and health belief model holds the most importance in predicting intentions to initiate antihypertensive medications.

Research Objectives

The main objectives are:

To evaluate factors that predict intention to initiate an antihypertensive medication.

The specific objectives are:

To determine the predictive ability of an integrated model of the theory of planned behavior and health belief model on intention to initiate an antihypertensive medication.

To rank the identified factors of intentions to initiate antihypertensive medications in order of relative importance.

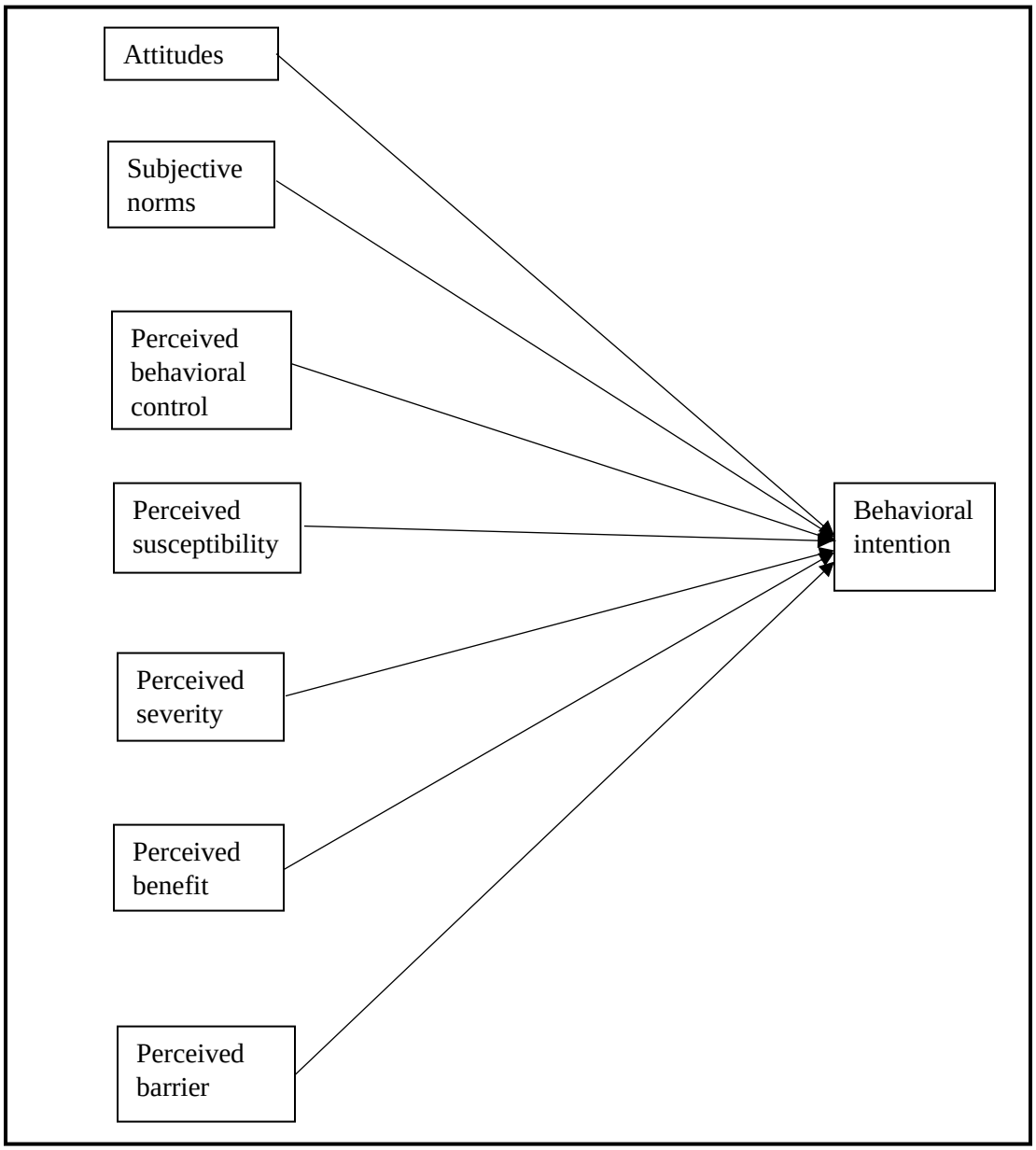

FIG 1: An integrated model of the health belief model and theory of planned behavior constructs.

CHAPTER III: METHODS

METHODS

Design, Sample and Data source

This study utilized a cross-sectional survey design in evaluating beliefs and factors that determine intention to initiate antihypertensive medications. The participants included a national sample of participants aged 18years and older who:

- Have not been previously diagnosed with hypertension.
- Have been identified as at risk for hypertension.
- Had been diagnosed with either pre-hypertension or hypertension but had not yet started any medications.

The sample was sourced from a national online panel provided by Qualtrics. This panel, consisting of diverse respondents in their natural environment, was chosen to enhance the study's external validity or generalizability. A prior power calculation determined a minimum sample size of 400[127]. However, the study sampled 1000 participants.

Measures

Vignette. Participants were presented with a hypothetical scenario, worded in line with the study by Mazor et al.[100]. The scenario is as follows:

> *"Imagine that two months ago, when you went to your doctor for a regular check-up, you found out your blood pressure was high. Your doctor talked to you about getting more exercise, reducing your salt intake, watching what you eat and getting lots of rest. Your*

doctor asked you to return in a month to get your blood pressure re-checked. When you returned, your blood pressure was still high. Your doctor seemed concerned and said that you would need to return to have it checked again. If it wasn't lower at that next visit, you would need to begin treatment. Today is the third time that you've had your blood pressure checked in three months, and once again it is high. Your doctor confirms the nurse's reading by checking it again, and it is still high."

Following the scenario, participants were prompted to answer questions based on the presented situation.

Demographic variables. The demographic data collected included age, gender, race, ethnicity, level of education, employment status, marital status, annual income, hypertension risk or diagnosis, comorbidities, and total number of current chronic medications.

Outcome variables. The primary outcome of this study was participant's intention to initiate antihypertensive medications (Fig 1). This measure consisted of four linear numeric items ranging from 'extremely unlikely' to 'extremely likely'. An example item is: "How likely or unlikely is it that you will consider initiating high blood pressure medications?"[117].

Predictor variables: The predictor variables are based on constructs from both the Health Belief Model and the Theory of Planned Behavior (See Fig 1)[122].

From the Health Belief Model:

Perceived severity:

- Measured using seven Likert scale items ranging from 'strongly disagree' to 'strongly agree'[80,128].

Perceived barriers:

- Measured with two Likert scale items from ‘strongly disagree’ to ‘strongly agree’ and three linear numeric items from ‘none at all’ to ‘a great deal’[117,128].

Perceived benefits:

- Measured using three Likert scale items ranging from ‘strongly disagree’ to ‘strongly agree’[128].

Perceived susceptibility:

- Measured using six Likert scale items ranging from ‘strongly disagree’ to ‘strongly agree’[128,129].

From the Theory of Planned Behavior:

Attitudes:

- Measured using one semantic differential scale item from ‘extremely bad’ to ‘extremely good’ and four Likert scale items from ‘strongly disagree’ to ‘strongly agree’[130].

Subjective norms:

- Measured using four Likert scale items from ‘strongly disagree’ to ‘strongly agree’[130].

Perceived behavioral control:

- Measured with two linear numeric items, one ranging from ‘extremely difficult’ to ‘extremely easy’ and the other from ‘not confident at all’ to ‘completely confident’[130].

For each construct, a scale score was computed by averaging all the respective items.

Study covariates: Variables controlled for during data analysis include sociodemographic variables as well as health-related factors. These included age, gender, race, ethnicity, income, level of education, employment status, marital status, hypertension risk or diagnosis, comorbidities, number of medications and general health. Age was treated as a continuous variable. Gender was categorized into three: male, female and other. Race was divided into seven categories: American Indian or Alaska native, Asian, African American, White, Other, Native Hawaiian or Pacific islander and Multiracial. Ethnicity was treated as a binary variable.

Level of education was an eight-category variable with levels: none, up to 6 years of school, up to 9 years of school, up to 12 years of school, some college or equivalent, college degree, master's degree, and doctorate degree. Income spanned five categories namely: Less than $25,000, $25,000 to $49,999, $50,000 to $99,999, $100,000 to $149,999, and $150,000 or more. Employment status had nine categories. These were employed full time (40 or more hours per week), employed part time (up to 39 hours per week), unemployed and actively seeking work, unemployed but not actively seeking, student, homemaker, self-employed, unable to work and retired. Marital status had four categories: single, married, divorced and other.

Hypertension risk or diagnosis was a binary variable. Participants who chose a 'yes' to any of the six hypertension risk screener questions were assigned a value of one. Those who responded 'no' to all questions were assigned a value of zero. Comorbidity was treated as a continuous variable, with a sum score of chronic conditions acting as a proxy for the number of comorbidities a participant had. The number of medications was categorized into six levels from none up to 5 or more. Lastly, general health was treated as a continuous variable.

Data collection

The survey was programmed using Qualtrics, a web-based tool used for designing and electronic distribution of questionnaires. Prior to pre-testing the instrument, an exemption from the University of Mississippi's Institutional Review Board (IRB) was obtained. To ensure the clarity, readability, and understandability of the questions, as well as to gauge the length of time needed to complete the survey, the questionnaire was pretested among graduate students at the University of Mississippi School of Pharmacy. The finalized questionnaire was subsequently distributed to a national sample of participants via an invitation email that clearly outlined the study's objectives. Included within this questionnaire was an informed consent form, which participants were required to acknowledge before proceeding with the survey. Eligibility for participation was restricted to individuals aged 18 and above. Those who had initiated medications for hypertension were excluded from the study. The initial questions of the survey focused on participants' hypertension diagnosis and medication history to screen out ineligible respondents. To ensure participants' attentiveness, an attention-check question was incorporated, asking them to identify the color 'purple' from among several color options.

Data Management

Upon completion, data from Qualtrics was exported into Microsoft Excel for preliminary cleaning and processing. Following this initial step, the cleaned data set was imported into the Statistical Package for the Social Sciences IBM (SPSS®) Version 29 for Windows® for analysis.

Statistical Analysis

The sample was characterized using demographic variables such as age, gender, race, ethnicity, level of education, employment status, marital status, annual income, hypertension diagnosis, medication intake, and comorbidities. Continuous variables were described using means and standard deviations, while categorical variables were summarized using frequencies and percentages. To assess the internal consistency reliability of items measuring various constructs, Cronbach's alpha was utilized. Bivariate analysis was conducted to determine the relationships among the constructs, as well as between each construct and intentions. Multivariable analysis was also carried out, controlling for potential confounders. To ascertain which construct was most important in predicting intention, relative weight analysis was used. A p-value threshold of 0.05 was considered statistically significant for all the tests.

Data cleaning and Assumption Testing

Prior to analysis, all numeric variables were examined through various IBM SPSS programs for accuracy of data entry, presence of outliers, missing values, collinearity, and fit between their distributions and the assumptions of the General Linear Model. First, partial regression plots were generated to check for the presence of outliers as well as violation of regression assumptions, and the results appeared satisfactory. Next, regression residuals were examined to further check for influential data points and assumption violation. Hoaglin and Welsch recommended a threshold for the identification of high leverage points as 2(P+1)/n with p being the number of predictors and n the sample size[131]. Using a threshold of 0.036 we identified 43 high leverage cases. Cook and Weisberg suggested a threshold of 1 for identifying influential data points[132]. Based on this threshold, there were no influential data points with the maximum cook's distance obtained being .049. Studentized deleted residuals were also generated. Using a

threshold of an absolute value of 2, we identified 70 discrepant data points[133]. Hence, a total of 105 influential data points were identified. Since there was no evidence that these 105 influential data points are not members of the intended population, they were flagged. Sensitivity analysis was conducted by refitting the regression model with and without the influential data points. Upon comparing the results, the coefficients from the model with the influential cases removed were different from the coefficients obtained with all the cases. Robust regression was then conducted using PROC ROBUSTREG in SAS. Since the results obtained from the robust regression procedure were similar to the results obtained without the influential data points, the results reported are without the outlier cases. Residual plots were also generated to check homoscedasticity, linearity and gaussian errors. The results of the plots were satisfactory. Normal probability plots were utilized in assessing normality and this was found to be satisfactory. Collinearity was assessed using variance inflation factor and tolerance values. The results were satisfactory as neither the tolerance value nor the variance inflation factor was below .10 or above 10 respectively[134]. Missing values were checked and there were no variables with missing values in more than 5% of the cases.

CHAPTER IV: RESULTS

RESULTS

Participant demographic characteristics

The detailed demographic characteristics of participants are presented in Table 1. A total of 941 participants were characterized with an average age of 41.3 years and a standard deviation of 14.8 years. Most participants were aged 18-34 years (37.7%) and 35-49 years (36.1%). 17.4% and 8.7% of participants were in the 50-64 years and 65 years and older age group respectively. A vast majority of the sample were residents of the United States (99.7%). Most identified as female (75.0%) with male being 23.5%. Regarding race, 76.5% of participants identified as white and 15.4% as black.

Table 1. Demographic Characteristics of the study sample

Characteristic (N = 941)	n (%)
Mean age (SD)	41.3 (14.8)
Age groups	
18 – 34 years	355 (37.7)
35 – 49 years	340 (36.1)
50 – 64 years	164 (17.4)
65 years and older	82 (8.7)
United States Resident	938 (99.7)
Sex	
Male	221 (23.5)
Female	706 (75.0)
Other/Would rather not say	14 (1.5)
Ethnicity	
Hispanic, Latino, or Spanish	109 (11.6)
Race	
White	720 (76.5)
Black or African American	145 (15.4)
American Indian or Alaska native	22 (2.3)
Asian	33 (3.5)
Native Hawaiian or pacific islander	8 (0.9)
Other	41 (4.4)
Highest level of education	
None	21 (2.2)
Up to 6 years of school	4 (0.4)
Up to 9 years of school	21 (2.2)
Up to 12 years of school	272 (28.9)
Some college or equivalent	269 (28.6)
College degree	259 (27.5)
Master's degree	76 (8.1)
Ph.D. or Doctorate	19 (2.0)
Marital status	
Married	351 (37.3)
Divorced	135 (14.3)
Single	403 (42.8)
Other/would rather not say	52 (5.5)

Table 1 (Cont.) Demographic Characteristics of the study sample

Characteristic (N = 941)	n (%)
Employment status	
Employed full-time (40 hours or more/week)	375 (39.9)
Employed part-time (Up to 39 hours/week)	108 (11.5)
Unemployed and currently searching for work	99 (10.5)
Unemployed and not currently searching for work	21 (2.2)
Student	45 (4.8)
Homemaker	95 (10.1)
Self-employed	65 (6.9)
Unable to work	45 (4.8)
Retired	88 (9.4)
Annual household income	
< $25,000	273 (29.0)
$25,000 – $49,999	279 (29.6)
$50,000 – $99,999	227 (24.1)
$100,000 – $149,999	98 (10.4)
$150,000 or more	64 (6.8)
Hypertension diagnosis*	604(64.2)
Chronic conditions	
Alcohol abuse	45 (4.8)
Alzheimer's disease and related dementia	1 (0.1)
Arthritis (Osteo or Rheumatoid)	129 (13.7)
Asthma	137 (14.6)
Atrial Fibrillation	9 (1.0)
Autism Spectrum Disorders	24 (2.6)
Cancer (Breast, Colorectal, Lung or Prostate)	8 (0.9)
Chronic Kidney Disease	8 (0.9)
Chronic Obstructive Pulmonary Disease	14 (1.5)
Depression	371 (39.4)
Diabetes	54 (5.7)
Drug abuse/Substance abuse	77 (8.2)
Heart Failure	13 (1.4)
Hepatitis (Chronic Viral B or C)	16 (1.7)
HIV/AIDS	2 (0.2)
Hyperlipidemia (High cholesterol)	49 (5.2)
Hypertension (High blood pressure)	177 (18.8)
Ischemic Heart Disease	2 (0.2)
Osteoporosis	29 (3.1)

Schizophrenia or other psychotic disorders	41 (4.4)
Stroke	6 (0.6)
None	307 (32.6)
Medications taking	
0	389 (41.3)
1	183 (19.4)
2	157 (16.7)
3	89 (9.5)
4	47 (5.0)
5 and above	76 (8.1)

Note: *Hypertension diagnosis implies choosing a yes to at least one (or any) of the hypertension diagnosis screener questions.

Correlation analysis

The correlation among all predictors as well as the relationship between the predictors and intention to initiate antihypertensive medications is presented in Table 2. Notably, attitude and perceived benefits had the strongest positive correlation (r = 0.69) while perceived barrier and perceived behavioral control had the strongest negative correlation (r = -0.25).

Table 2: Correlation among all predictors and between predictors and outcome

Variable	Attitude	Perceived Severity	Perceived Barrier	Perceived Benefit	Perceived Susceptibility	Subjective norm	Perceived Behavioral Control	Intention
Attitude	-	0.33	-0.24	0.69	0.25	0.60	0.57	0.67
Perceived Severity	0.33	-	0.18	0.31	0.22	0.29	0.22	0.32
Perceived Barrier	-0.24	0.18	-	-0.19	-0.07	-0.15	-0.25	-0.29
Perceived Benefit	0.69	0.31	-0.19	-	0.20	0.42	0.46	0.51
Perceived Susceptibility	0.25	0.22	-0.07	0.20	-	0.25	0.18	0.25
Subjective norm	0.60	0.29	-0.15	0.42	0.25	-	0.54	0.73
Perceived Behavioral Control	0.57	0.22	-0.25	0.46	0.18	0.54	-	0.70
Intention	0.67	0.32	-0.29	0.51	0.25	0.73	0.70	-

Scale reliability analysis:

Table 3 shows the results for the scale reliability analysis assessed using Cronbach's alpha. All scales exhibited good to excellent reliability as none of the scales had a Cronbach's alpha coefficient below 0.73[127].

Table 3: Scale reliability statistics

Scale Name	Number of Items	Cronbach's Alpha	Mean	Standard Deviation
Attitude	5	0.86	19.32	3.60
Perceived Severity	7	0.77	27.07	4.71
Perceived Barrier	5	0.75	16.21	4.04
Perceived Benefit	3	0.80	11.84	2.16
Perceived Susceptibility	6	0.73	21.23	4.20
Subjective norm	4	0.88	15.51	3.48
Perceived Behavioral Control	2	0.83	7.46	1.91
Intention	4	0.92	15.02	3.67

Overall Regression:

A partial F test was employed to determine if the addition of attitudes, subjective norms, perceived behavioral control, perceived benefits, perceived barriers, perceived susceptibility, and perceived severity improved prediction of intention to initiate antihypertensive medications beyond that afforded by other background factors. The overall regression model results are presented in Table 4. Two models were examined. Model 1 comprising of twelve predictors accounted for 8% ($R^2 = 0.08$) of the variation in intention. After accounting for the number of predictors, the model explained 7% (Adj-$R^2 = 0.07$) of the variance in intention and was statistically significant, $F (12, 928) = 6.96$, $p<.001$. Model 2 incorporated an additional seven variables for a total of nineteen predictors. This model explained an additional 65% ($R^2 = 0.65$)

of the variation in intention resulting in a total variance explained of 73% ($R^2 = 0.73$). The adjusted R-squared for this model was 0.72 (Adj-$R^2 = 0.72$) indicating that after accounting for the number of predictors, the model explained 72% of the variance in intention. This model was also statistically significant, $F(19, 921) = 129.89$, $p<.001$.

Table 4: Overall Regression

	Model 1	Model 2	Change
Number of predictors	12	19	7
R-squared	0.08	0.73	0.65
Adjusted R-square	0.07	0.72	0.65
Degree of freedom	928	921	7
F-value	6.96	129.89	312.61
P-value	< .001	< .001	< .001

Regression coefficients and Relative weight analysis:

The role of each variable in the prediction was examined using the partial coefficients table presented in table 5. Overall, Attitude, Subjective norm, Perceived behavioral control, and Perceived severity had a positive significant relationship with the intention to initiate antihypertensive medications while Perceived barrier had a negative significant relationship. However, the relationship for perceived benefits as well as perceived susceptibility was not statistically significant. Specifically,

Attitude: Holding all other variables constant, each one unit increase in the attitude score resulted in a significant increase of 0.21 units in intention ($B = 0.21$, $SE = 0.04$, $\beta=0.17$, $t=5.87$, $p<.001$).

Subjective Norms: Had a strong significant positive relationship with intention. For every one unit increase in subjective norm score, there was a significant increase of 0.41 units in intention ($B = 0.41$, $SE = 0.02$, $\beta=0.40$, $t=16.99$, $p<.001$).

Perceived Behavioral Control: Also had a robust significant positive relationship with intention. A one unit increase in perceived behavioral control score increased intention by 0.32 units (B = 0.32, SE = 0.02, β=0.33, t=14.41, p<.001).

Perceived severity: Each one unit increase in the perceived severity score resulted in 0.12 units increase in intention (B = 0.12, SE = 0.03, β=0.08, t=4.27, p<.001).

Perceived barrier: Showed a significant negative relationship with intention. For every one unit increase in the barrier perceived, intention decreased by 0.14 units (B = -0.14, SE = 0.02, β=-0.12, t=6.23, p<.001).

Perceived benefit: Although had a positive relationship with intention, this was not significant (B = 0.05, SE = 0.03, β=0.04, t=1.58, p=0.12).

Perceived susceptibility: Also had a non-significant positive relationship with intention (B = 0.01, SE = 0.03, β=0.01, t=0.52, p=0.61).

Next, a relative weight analysis[125] was conducted using RWA-Web[135]; results from this analysis are also presented in Table 5. Confidence intervals for the individual relative weights and all corresponding significance tests were based on bootstrapping with 10,000 replications, an approach recommended by Tonidandel et al.[136]. Bias corrected and accelerated confidence intervals were used because of their superior coverage accuracy as recommended by Tonidandel et al.[136]. In all cases, 95 % Confidence Intervals (Cis) were used (corresponding to a significance testing alpha level of 0.05).

These results indicate that a weighted linear combination of the predictor variables explained over half of the variance in the intention criterion (R^2 = 0.73). An examination of the relative weights revealed that all seven predictors explained a statistically significant amount of variance

in intention as none of the 95 % CIs for the tests of significance contained zero. The most important variables were Subjective Norm (RW = 0.22 or 30.84% of the explained variance), Perceived Behavioral Control (RW = 0.19 or 26.04% of the explained variance), and Attitude (RW = 0.13 or 17.17% of the explained variance).

The relative weight results differ slightly from what was obtained from the traditional multiple regression analysis. Specifically, in the traditional analysis neither Perceived Benefit nor Perceived Susceptibility provided a statistically significant incremental effect in the prediction of intention, holding constant all the remaining predictors. This disparity observed between the significance of regression coefficients and relative weights is not unusual and simply reflects that these two statistics are addressing different research questions[136]. Regression weights are focused on incremental prediction and when predictors are correlated, variables that yield a significant bivariate relationship may not yield a significant incremental relationship. Conversely, relative weights are focused on explaining which predictors are explaining a substantial variance in outcomes irrespective of the presence of correlated predictors. Hence, although perceived susceptibility and perceived benefit individually explain some amount of variance in intention, their shared correlation with themselves and with other predictors in the model results in their explanation of little unique, incremental variance.

We were also interested in testing whether the relative contribution of Subjective Norms, Perceived Control and Attitudes to the overall R^2 differed significantly from the other predictors. Results indicated that the relative weight of Subjective Norm (RW = 0.22) was significantly higher than all the other predictors (i.e., CIs for the comparisons did not include zero), except for Perceived Behavioral Control (RW = 0.19).

In summary, it appears that most of the explained/predicted variance in intention is attributed to three predictors: Subjective Norm (30.84% of model R^2), Perceived Behavioral Control (26.04% of model R^2), and Attitude (17.17% of model R^2).

Table 5: Regression coefficients and Relative weight analysis

Variable Name	B (Unstandardized coefficient)	Standard Error	β (Standardized coefficient)	t-value	P-value	RW	CI-L	CI-U	RS-RW (%)
Attitude [a, c]	0.21	0.04	0.17	5.87	< .001	0.13	0.11	0.14	17.17
Perceived Severity [a, b, c]	0.12	0.03	0.08	4.27	< .001	0.03	0.02	0.05	4.71
Perceived Barrier [a, b, c]	-0.14	0.02	-0.12	-6.23	< .001	0.04	0.02	0.05	4.96
Perceived Benefit [a, b, c]	0.05	0.03	0.04	1.58	0.12	0.06	0.05	0.08	8.62
Perceived Susceptibility [a, b, c]	0.01	0.03	0.01	0.52	0.61	0.02	0.00	0.02	2.07
Subjective norm [b]	0.41	0.02	0.40	16.99	< .001	0.22	0.20	0.26	30.84
Perceived Behavioral Control [b]	0.32	0.02	0.33	14.41	< .001	0.19	0.16	0.22	26.04

Note: RW = Raw relative weight (without rounding error, raw weight will sum to R squared); CI-L = lower bound of confidence interval used to test the statistical significance of raw weight; CI-U = upper bound of confidence interval used to test the statistical significance of raw weight; RS-RW = relative weight rescaled as a percentage of predicted variance in the criterion variable attributed to each predictor (within rounding error rescaled weights sum to 100 %); a = The raw relative weight for this variable differs significantly from the raw relative weight obtained for Subjective Norm; b = The raw relative weight for this variable differs significantly from the raw relative weight obtained for Attitude; a = The raw relative weight for this variable differs significantly from the raw relative weight obtained for Perceived Behavioral Control. Relative weights do not add up due to the absence of covariates.

CHAPTER V: DISCUSSION

DISCUSSION

Why do individuals behave the way they do? Specifically, and in this context, why do some individuals decide to begin taking medications for high blood pressure and others do not? Attempting to address this question could result in the potential identification of numerous factors. For instance, a systematic review by Lee et al. exploring reasons for non-initiation of medications identified a multitude of factors. These spanned patient-related to medication, healthcare-provider, healthcare-system and socioeconomic factors[11].

Moreover, trying to provide an answer without a guiding framework or theory could potentially result in non-significant findings and ineffective interventions. This is exemplified in the studies conducted by Fischer et al. and Raebel et al. Fischer et al conducted an intervention study to determine the effectiveness of telephone calls to patients, encouraging them to take their medications for various chronic conditions including hypertension[58]. Conversely, Raebel et al tried to predict primary nonadherence to antihypertensives using patient characteristics such as ethnicity, insurance type and race[73]. However, both studies resulted in ineffective interventions and weak predictive ability, respectively. In light of these findings, this study used an expanded model of the theory of planned behavior as a guide in determining patient factors influencing the intention to initiate antihypertensive medications.

According to the theory of planned behavior, the decision to engage or refrain from a behavior is influenced first by underlying beliefs regarding the behavior such as behavioral, normative, and control beliefs[120]. These beliefs then shape attitudes, subjective norms and perceived behavioral

control, respectively[120]. These in turn influences intention which guides behavior[120]. However, these beliefs might have originated from other sources or background factors[120]. These sources could include direct or observational experiences as well as external or informational sources, like social media[120]. Hence, based on this theoretical lens, several key factors were identified as influencing the decision to start high blood pressure medications.

The Power of Social Pressure: Subjective Norm

First and foremost, subjective norms was found to be the most important determinant of intention. subjective norms relates to the societal pressure perceived by individuals to engage in specific behaviors[120]. From here onwards, individuals eliciting this social pressure would be referred to as 'social agents.' There are two subjective norm categories: injunctive and descriptive. The former exists when behavior is motivated by perceived societal expectations, essentially, "what others believe I should do". Conversely, the latter occurs when behavior is driven by observing others, or "what I see others doing". Injunctive norm is also determined by normative beliefs, which reflect the perceived expectation of important individuals such as friends, family, or in a healthcare context, physicians. Furthermore, injunctive norms are influenced by one's motivation to comply, indicating the significance attributed to the opinions of these important individuals[120].

According to Fishbein and Ajzen, there are several reasons why individuals might be motivated to adhere to social pressures. These includes reward power, where adherence is motivated by benefits; coercive power, where the goal is avoiding punishment; legitimate power, where the societal role of the social agent drives adherence; expert power, where adherence is driven by the social agent's knowledge, skills or abilities; and referent power, where the drive is being like the social agent[120].

Considering these motivations, the finding that subjective norm is the most important determinant of intention to start high blood pressure medications underscores the role healthcare providers, friends, significant others, community leaders, patient organizations, peers, social support and societal pressure might play in medication initiation decisions. It also suggests that interventions could be directed towards these social agents to help move the needle in influencing patients decision to initiate medications for high blood pressure[1]. This observation aligns with previous research, highlighting the impact of factors such as patient-provider communication, trust in the healthcare provider, social support and shared decision making on primary nonadherence to antihypertensive medications[60,91,100,137].

Personal Agency's Role: Perceived Behavioral Control

Moving forward, perceived behavioral control was found to be the second most-important determinant of intention. Interestingly, its relative importance was not significantly different from that of subjective norms. Studies have shown perceived behavioral control to be a combination of elements such as 'capacity', which refers to an individual's belief about their ability to engage in a behavior; and 'autonomy', indicating the extent of control a person believes they have over executing a behavior, regardless of obstacles[120].

Essentially, perceived behavioral control reflects an individual's confidence in their ability to engage in a behavior in spite of prevailing circumstances or challenges[120]. This confidence stems from control beliefs which weigh the perceived presence of facilitating factors against potential obstacles. A higher perception of the presence of facilitating factors, coupled with fewer potential obstacles, raises an individual's perceived behavioral control[120]. Hence, the study results suggest that a perception of the availability of ample opportunities and resources and

fewer barriers by individuals could lead to an increased likelihood of initiating medications for hypertension.

Therefore, while ensuring that individuals understand the benefits of medications, it is important to empower them, address potential barriers, and assist with both accessibility and affordability issues.

The Weight of Mindsets: Attitude

Next in line, attitude is the third factor deemed important in determining intention. Attitude entails an individual's perceived likelihood that engaging in a behavior will lead to a certain outcome[120]. Such attitude could be positive (favorable) or negative (unfavorable)[120]. The impact of attitude on initiation of high blood pressure medications is supported by previous research. For instance, a study by Polinski et al. identified patient attitudes towards receiving an antihypertensive medication as a factor which could impact primary nonadherence[91]. Together with subjective norms and perceived behavioral control, these constructs explained about fifty-four percent of the variance in intention. This aligns with prior literature which highlighted the fact that these constructs have the capacity to explain fifty to sixty percent of the variance in intention. Together with constructs from the health belief model, the theory explained an additional fifty-six percent variation in intention.

Perceived Benefits – Overrated?

Delving further, the fourth factor identified is perceived benefits. The relative importance accrued to perceived benefits, one of the constructs from the health belief model, was much lower than attitudes, perceived behavioral control and subjective norms. Interestingly, a study by Mazor et al. found belief about medication effectiveness to be a significant predictor of the intent

to initiate antihypertensive medications[100]. The weaker influence of perceived benefits observed in this study could be due to the chronic and asymptomatic nature that characterizes hypertension. Unlike with acute conditions, there is an absence of an immediate positive reinforcement when medications are taken. This suggests that an understanding of the benefits that could be derived from initiating high blood pressure medications might not be enough to potentially tilt the balance in favor of medication initiation. Conversely, it suggests that there could be an issue with the way in which the benefits of these medications are being conveyed. Hence, interventions such as education campaigns which emphasize the long-term benefits of antihypertensive medications could be a suitable next step.

Unpacking the impact of Perceived Severity, Barriers, and Susceptibility

Lastly, although perceived severity, perceived barriers and perceived susceptibility were identified as significant predictors of intention from the relative weight analysis, they explained only a small proportion of its variance with perceived susceptibility having the least explanatory power. Delving deeper into each:

Perceived Susceptibility: The weaker impact of perceived susceptibility might have stemmed from the demographic makeup of the study participants. Most of the participants were younger (between the ages of 18 and 49years). As such they might not see themselves at risk of having hypertension. Other reasons could be the perception of leading a healthy lifestyle as well as an absence of a family history of hypertension.

Perceived Severity: The lower influence of perceived severity might be due to the asymptomatic nature of hypertension. Hence, some individuals might underestimate its seriousness and view it as a normal part of aging.

Perceived Barriers: The muted impact of perceived barriers might be attributed to the perceived presence of external support systems such as insurance coverage which reduces concerns about barriers such as medication costs.

In conclusion, it is important to state that these constructs are from the health belief model. Hence, they may not be suitable for explaining variation in intention which is specific to the theory of planned behavior. This aligns with the sufficiency assumption which states that inclusion of other variables asides attitudes, subjective norm and perceived behavioral control should not considerably improve the prediction of intention[120].

Exploration: Relative Weight Analysis[138].

Aside from assessing the predictive abilities of predictors on outcomes, another reason for conducting multiple regressions is to assess the relative importance of different predictors[138]. While several methods such as Bivariate correlations; Standardized regression coefficients; Dominance analysis and Relative weights (Epsilon) have been utilized in achieving this, they each have their limitations[123,138].

One of the pitfalls of relying solely on standardized regression coefficients as an effect size measure is that it does not account for correlation among predictors[139]. This could result in misleading conclusions about the contribution of a predictor to the regression model[139]. Another issue is its context specificity meaning that it is dependent on, and changes based on the predictors included or removed from the model[139]. Furthermore, standardized regression coefficients are subject to suppressor effects where an added predictor suppresses irrelevant variance from another predictor even though it has no direct relationship with the outcome[139]. Due to these limitations, an alternative which has been explored is relative weight analysis.

Here is how it works: Using principal components analysis, the predictors are transformed in such a way that they are related to the outcome but are orthogonal/uncorrelated with each other[125]. The outcome variable is then regressed on these new sets of orthogonal predictors[125]. The amount of variance in the outcome explained by all the predictors (R-squared) is broken down into its individual components to get at the amount of variance explained by each orthogonal predictor[125]. After transforming the results to the original metric, the individual amount of variance explained becomes the relative weight of the predictors[125]. These relative weights are then converted to percentages[125]. The key takeaway here, which is the strength of relative weight analysis, is that it accounts for correlation among predictors. Therefore, it provides richer insight as to the importance of a predictor alone as well as in the presence of other predictors[126].

The result of the study showed agreement among most of the predictors in terms of their ranking and significance, for both the traditional regression and the relative weight analysis. This could be because under conditions of low multicollinearity, results from the use of relative weights as well as standardized regression coefficients yields similar results[126]. However, disparities were identified between the two methods for perceived susceptibility and perceived benefits. As LeBreton et al. pointed out, two factors could be inherently responsible for this disparity: The number of predictors and their intercorrelation[126]. Hence, the non-significant finding for perceived susceptibility and perceived benefits from the traditional regression might be due to their correlation with other predictors in the model.

Study Strengths, Limitations and The Path Forward

A major strength to this study is its external validity. This is due to the large and diverse participants sampled within their natural setting. A potential limitation of this study is literal

inconsistency or hypothetical bias especially because respondents were responding to an imagined scenario. As such, their intentions stated in response to the scenario might differ from their actual behavior in real life[120]. Additionally, although these results demonstrate a predictive relationship, these should not be misinterpreted as causal. Furthermore, it is important to note that intention is not the behavior itself. Rather, it indicates the perceived likelihood of engaging in the behavior. Regardless, all else being equal (absence of environmental barriers, presence of skills and abilities), intention to perform a behavior would result in actually performing the behavior[120].

A qualitative study conducted by Gil girbau et al. highlighted several factors which could be responsible for medication non initiation from the patient perspective[140]. These factors were placed within domains such as perception of the condition and medication; relationship with the healthcare system; interpersonal and intrapersonal factors; and influence of external factors such as family, friends, advertisements and social media[140]. This highlights the fact that making the decision to initiate medications involves a complex process of interacting factors that goes beyond just the patient. Therefore, future studies could utilize an ecological model in examining how factors beyond the patient could influence the decision to initiate medications for hypertension.

Furthermore, previous literature has shown past behavior, anticipated affect and self-identity to have the potential to explain variance in intention over and above that already explained by attitudes, subjective norms and perceived behavioral control[120]. Hence, future studies could examine an expanded model of the theory with these constructs incorporated.

In addition, participant demographic type, previous experiences or interactions could influence beliefs differently[120]. For instance, previous informational experiences could influence beliefs

about behaviors differently for African American versus Hispanic population. This could result in differing beliefs, intentions, and behaviors for these different demographic groups. Hence, future studies could examine if the predictive relationship of the theoretical constructs differs for different races or age groups.

Concluding Thoughts

This study has examined the most influential factors in the decision to begin antihypertensive therapy. This is in line with recommendations by the World Health Organization (WHO) advocating for a tailored intervention approach to addressing medication nonadherence[1]. Amid scarce resources, targeting interventions towards factors deemed most important could result in tremendous cost savings for all stakeholders. This cost saving would be achieved through decreased healthcare costs from preventable hospitalizations and waste, increased patient quality of life, increased productivity and a resultant improvement in health economics and outcomes[1].

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