Abstract

Background

Primary Nonadherence (PMN) to antihypertensive medications constitutes a problem for stakeholders from every viewpoint — patient, provider, payer, and society. Utilizing a theory in understanding beliefs and factors which holds most importance in predicting intention to initiate antihypertensive medications could help move the needle in favor of a tailored intervention approach.

Purpose

To identify the most influential predictors of intention to initiate antihypertensive medications using relative weight analysis.

Methods

A vignette-based, cross-sectional survey was conducted using an online sample of adult participants who have not yet initiated antihypertensive medications. Constructs from the Health Belief Model and the Theory of Planned Behavior were used to identify predictors of intentions to initiate antihypertensive medications. Multivariable linear regression was used to evaluate the associations between predictors and intentions. Relative weight analysis was used to rank the predictors.

Results

Measurement scales used exhibited good to excellent reliability (Cronbach's alphas ranged from 0.73-0.92). Among 941 participants (average age of 41.3 years; 67% with at least one chronic health condition; 75% female), two models were examined: model 1 comprised of twelve

background and demographic predictors accounted for 8% of the variation in intentions, while model 2 with seven additional theory-based predictors explained an additional 65%. Overall, attitudes (unstandardized coefficient (B)=0.21, standardized coefficient (β)=0.17, p<.001), subjective norms (B=0.41, β=0.40, p<.001), perceived behavioral control (B=0.32, β=0.33, p<.001), and perceived severity (B=0.12, β=0.08, p<.001) had significant positive relationships with intentions. Perceived barriers (B=-0.14, β=-0.12, p<.001) had a significant negative relationship, while perceived benefits (B=0.05, β=0.04, p=0.12) and perceived susceptibility (B=0.01, β=0.01, p=0.61) had non-significant relationships with intentions. The most influential predictors were subjective norms (30.8% of the explained variance), perceived behavioral control (26.0%), and attitudes (17.2%).

Conclusion

Tailored approaches are needed to help patients make appropriate medication use decisions. Amid scarce resources, targeting interventions towards the most influential predictors could result in cost savings for all stakeholders through decreased hospitalization, enhanced productivity, improved quality of life, and better health outcomes.

ASSESSING THE RELATIVE IMPORTANCE OF CONSTRUCTS FROM AN EXPANDED THEORY OF PLANNED BEHAVIOR MODEL IN THE PREDICTION OF INTENTION TO INITIATE ANTIHYPERTENSIVE MEDICATIONS

Introduction

The concept of 'medication nonadherence' constitutes a pernicious problem for stakeholders regardless of whose perspective is taken — patient, provider, payer, or society[1]. Medication nonadherence 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 individuals do not obtain refills or miss doses of their medications; while primary non-adherence occurs when medications are not filled, redeemed, or taken within a specified period after they are prescribed[2–6]. Although both adherence categories hold tremendous importance in the treatment of chronic conditions, it could be argued that the initiation of medications holds greater importance. This is because this initial phase is what sets the stage for long-term adherence to medicines for chronic conditions. Therefore, it is important to understand how this phase is influenced by not only external factors such as insurance type but also intrinsic factors such as individual beliefs. As a result, interventions can be targeted toward these beliefs to modify them favorably with the aim of improving healthcare outcomes. However, compared with secondary nonadherence, primary nonadherence (PMN) has been given less priority and is a less studied phase of medication nonadherence[7,8]. 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[3,9]. PMN is affected by several factors which includes socioeconomic, patient, provider, prescription, and disease factors and has been

examined in disease areas such as dermatology, oncology, arthritis, and cardiovascular conditions[9–13].

Examining non-initiation of medications meant for cardiovascular conditions such as hypertension potentially constitutes an interesting investigation due to the asymptomatic nature that characterizes these conditions. More so, hypertension is highly prevalent and poses significant cost to the government, payers, healthcare system, and patients[14,15]. Heart disease and stroke, which are potential downstream consequences of hypertension, are the leading causes of death in the United States[16]. Hence, an active initiation of medications for hypertension could help forestall inauspicious economic, clinical and humanistic outcomes. To this end, it might be important to identify factors which hold the most importance in influencing antihypertensive medications initiation decisions. This would aid evidence-based tailoring of scarce resources towards these factors to modify them favorably. A few studies have sought to identify these factors. However, most of them to date have taken an atheoretical approach. Utilization of theories could help better understand the relationships of interest in addition to improving the generalizability of findings[17]. Furthermore, theory integration might be better in explaining variability in the outcome of interest as one theory could help address limitations inherent in the other and vice-versa[18–20]. Therefore, this study seeks to utilize an expanded model of the theory of planned behavior in identifying factors and beliefs which hold the most importance in predicting intentions to initiate antihypertensive medications.

Method

Design, Sample and Data source

We conducted a cross-sectional survey of a national sample of participants aged 18years and older and falling into either of these categories: Have not been previously diagnosed with hypertension; Have been identified as at risk of 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. A prior power calculation determined a minimum sample size of 400[21]. However, the study sampled 1000 participants.

Study Measures

Vignette: Participants were presented with a hypothetical scenario, worded in line with the study by Mazor et al[22]. 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, sex, 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. 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?"[23].

Predictor variables: The predictor variables were based on constructs from the Theory of Planned Behavior and the Health Belief Model[24]. Perceived severity was measured using seven Likert scale items ranging from 'strongly disagree' to 'strongly agree'[25,26]. Perceived barrier was 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'[23,26]. Perceived benefit was measured using three Likert scale items ranging from 'strongly disagree' to 'strongly agree'[26]. Perceived susceptibility was measured using six Likert scale items ranging from 'strongly disagree' to 'strongly agree'[26,27]. Attitude was measured using one semantic differential scale item from 'extremely bad' to 'extremely good' and four Likert scale items from 'strongly disagree' to 'strongly agree'[28]. Subjective norms was measured using four Likert scale items from 'strongly disagree' to 'strongly agree'[28]. Perceived behavioral control was 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'[28]. 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, sex, race, ethnicity, income, level

of education, employment status, marital status, hypertension risk or diagnosis, comorbidities, number of medications and general health.

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 collection ended on the 17th of October 2023. 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. 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[29]. 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[30]. 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[31]. Hence, a total of 105 influential data points were identified. 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[32]. Missing values were assessed and there were no variables with missing values in more than 5% of the cases. “Study methods and results are reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for cross-sectional studies”.

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.

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).

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[33].

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% (R2 = 0.08) of the variation in intention. After accounting for the number of predictors, the model explained 7% (Adj-R2 = 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% (R2 = 0.65) of the variation in intention resulting in a total variance explained of 73% (R2 = 0.73). The adjusted R-squared for this model was 0.72 (Adj-R2 = 0.72) indicating that 72% of the variation in intention was explained by the

model after accounting for the number of predictors. This model was also statistically significant, F (19, 921) = 129.89, p<.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 (B = 0.21, SE = 0.04, β=0.17, t=5.87, p<.001), Subjective Norm (B = 0.41, SE = 0.02, β=0.40, t=16.99, p<.001), Perceived Behavioral Control (B = 0.32, SE = 0.02, β=0.33, t=14.41, p<.001), and Perceived Severity (B = 0.12, SE = 0.03, β=0.08, t=4.27, p<.001) had a positive significant relationship with the intention to initiate antihypertensive medications while Perceived barrier (B = -0.14, SE = 0.02, β=-0.12, t=6.23, p<.001) had a negative significant relationship. However, the relationship for perceived benefits (B = 0.05, SE = 0.03, β=0.04, t=1.58, p=0.12) as well as perceived susceptibility (B = 0.01, SE = 0.03, β=0.01, t=0.52, p=0.61) was not statistically significant.

Next, a relative weight analysis was conducted using RWA-Web and results from this analysis are presented in Table 5[34,35]. 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.[36]. Bias corrected and accelerated confidence intervals were used because of their superior coverage accuracy as recommended by Tonidandel et al.[36]. In all cases, 95 % Confidence Intervals (Cis) were used (corresponding to a significance testing alpha level of 0.05). The results indicates 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[36]. 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 Behavioral 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).

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[10].

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[37]. Conversely, Raebel et al tried to predict primary nonadherence to antihypertensives using patient characteristics such as ethnicity, insurance type and race[38]. However, both studies resulted in ineffective interventions and weak predictive ability, respectively. Considering 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[39]. These beliefs then shape Attitudes, Subjective Norms and Perceived Behavioral Control, respectively[39]. These in turn influences intention which guides behavior[39]. However, these beliefs might have originated from other sources or background factors[39]. These sources could include direct or observational experiences as well as external or

informational sources, like social media[39]. 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, Subjective Norm was found to be the most important predictor of intention. Subjective Norm relates to the societal pressure perceived by individuals to engage in specific behaviors[39]. 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 "what others believe I should do." 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[39]. 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[39].

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 favor of initiating

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[22,40–42].

Personal Agency's Role: Perceived Behavioral Control

Moving forward, Perceived Behavioral Control was found to be the second most-important predictor of intention. Interestingly, its relative importance was not significantly different from that of Subjective Norm. 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[39]. Essentially, perceived behavioral control reflects an individual's confidence in their ability to engage in a behavior despite prevailing circumstances or challenges[39]. 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[39]. 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 belief about the likelihood that engaging in a behavior will lead to a certain outcome[39]. Such Attitude could be positive (favorable) or negative (unfavorable)[39]. 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 Attitudes towards receiving an antihypertensive medication as a factor which could impact primary nonadherence[41]. Together with Subjective Norm 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[39]. 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[22]. 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 alone 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 high blood pressure. 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 of the Theory of Planned Behavior

which states that inclusion of other variables asides Attitudes, Subjective Norm and Perceived Behavioral Control should not considerably improve the prediction of intention[39].

Exploration: Relative Weight Analysis

Aside from assessing the predictive abilities of predictors on outcomes, another reason for conducting multivariable regression analysis is to assess the relative importance of these predictors[43]. 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[43,44].

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[45]. This could result in misleading conclusions about a predictor's contribution to the regression model[45]. Another issue is its context specificity meaning that it is dependent on, and changes based on the predictors included or removed from the model[45]. 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[45]. Due to these limitations with standardized regression coefficients, 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[34]. The outcome variable is then regressed on these new sets of orthogonal predictors[34]. While in this transformed orthogonal metric, the total variance explained by all of the predictors combined is broken down into parts unique to each predictor[34]. After transforming the results back to the

original metric, the unique variance explained by each predictor becomes its relative weight[34]. These relative weights are then converted to percentages[34]. The key takeaway here, which is the strength of relative weight analysis, is that it accounts for correlation that might exist among predictors[34]. Therefore, it provides richer insight as to the importance of a predictor alone as well as in the presence of other predictors[46].

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 and standardized regression coefficients would be similar[46]. 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[46]. 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 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[39]. 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 performing the behavior[39].

A qualitative study conducted by Gil-Girbau et al. highlighted several factors which could be responsible for medication non initiation from the patients' perspective[47]. 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[47]. 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[39]. Hence, future studies could examine an expanded model of the Theory of Planned Behavior with these constructs incorporated. In addition, previous experiences or interactions could influence beliefs differently for different participant demographics[39]. For instance, previous informational experiences could influence beliefs about behaviors differently for Blacks versus Whites. This could result in differing relationships between beliefs and intentions 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 medications. 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 quality of life, increased productivity and a resultant improvement in health economics and outcomes[1].

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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.

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	-

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

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

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.