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The Value of Online Medication Rating Systems to Older Adults and Their Association with Self-Reported Outcomes

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Of the Requirements for the Degree
Doctor of Philosophy
From The University of Tennessee

By
Yazed Sulaiman AlRuthia
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DEDICATION

This dissertation is dedicated to my parents, Sulaiman Al-Ruthia and Mona Al-Amari, who always believed in me and helped me believe more in myself. I also dedicate this dissertation to my wife, Nuha Al-Jadeed whose encouragement has meant so much to me during the pursuit of my graduate degree. Without their love, patience, and support this process would have been harder, longer, and very lonely. Thank you so much for travelling along this dissertation journey with me.

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ABSTRACT

The Internet is a powerful and very popular vehicle for distributing judgment-free health information to patients. Multiple studies have examined the role of online health information as well as physician-rating websites in health care. Studies have examined the value of online drug information for patients and the value of the online drug information for patients. However, no study has examined the usefulness or value of online medication rating websites in facilitating physician-patient communication or participant-reported outcomes. In this study, the value of online medication rating websites to older adults in facilitating communication with their physicians using a newly developed tool was assessed. Additionally, the participant-reported outcomes of quality of life, satisfaction with physician communication, beliefs about medications, and medication adherence plus the relationship between the older adults' actual ratings of their antihypertensive medications and their self-reported outcomes were examined.

Older adults with poor quality of life were more likely to view the online medication rating websites more favorably than participants who enjoy good quality of life. Participants who liked to share health decisions with their physicians were also more likely to have favorable views of the online websites. In addition, older adults with hypertension, who highly rated their antihypertensive medication regimens, were more likely to have good physical quality of life, high satisfaction with physician communication, positive beliefs about medications, and high medication adherence. Older adults with poor quality of life were more likely to be unsatisfied with their antihypertensive medications, have multiple comorbidities, limited health literacy, low satisfaction with their communication with their physicians, take multiple medications, and were more likely to view online medication rating websites favorably compared to their counterparts with good quality of life. Online medication rating websites may play an important role in enhancing physician-patient communication particularly among this segment of the patient population.

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LIST OF ABBREVIATIONS

BMQ	Beliefs about Medicines Questionnaire
CAD	Coronary Artery Disease
CHF	Congestive Heart Failure
COPD	Chronic Obstructive Pulmonary Disease
EQ-5D	EuroQol Five Dimensions Questionnaire
EQ-VAS	EuroQol Visual Analogue Scale
HRQoL	Health-Related Quality of Life
HTN	Hypertension
IBS	Irritable Bowel Syndrome
MCS-12	The 12-Item Mental Component Summary of the Short Form Health Survey
MI	Myocardial Infarction
MMAS-8	The 8-Item Morisky Medication Adherence Scale
NHP	Nottingham Health Profile
PCAS	Primary Care Assessment Survey
PCS-12	The 12-Item Physical Component Summary of the Short Form Health Survey
PROs	Participant-Reported Outcomes
PROMs	Patient-Reported Outcome Measures
PROMEX	Patient Reviews of Medication Experiences
QoL	Quality of Life
RX	Prescription Medication
SF-12	The 12-Item Short Form Health Survey
SF-36	The 36-Item Short Form Health Survey

CHAPTER 1.   INTRODUCTION

1.1   Background

As people age they become more prone to diseases in general and to the chronic health conditions (i.e., diabetes, hypertension, and osteoporosis) in particular. Thus, chronic diseases are more prevalent among this segment of the population. Further, an ever-greater proportion of this population survives with multiple health conditions. Hence, older adults take a greater number of prescription medications than any other segments of the population. This makes them more susceptible to adverse drug events given their diminished physiological reserve (Wasson, 2008). In addition, many studies have shown a correlation between increasing age and higher adverse drug events (ADEs) rate. Besides the frailty of the elderly, which makes them more predisposed to the side effects of the medications, they are usually on multiple prescription medications. Taking multiple medications increases the likelihood of developing adverse drug reactions or interactions since the toxicity of any medication can be potentiated by another medication in the patient's medication list (i.e., by inhibiting or inducing its metabolism). Therefore, effective communication between the physicians and their patients can address some of these issues by changing or removing certain medications from their medication lists, and by adopting a holistic approach in managing the elderly patients' health conditions rather than treating each condition separate from the other (Routledge, O'Mahony, & Woodhouse, 2004).

Generally speaking, patients want their physicians to inform them about their health conditions, the treatment options, as well as the safety profile and cost of each medication if pharmacological options were chosen (Nair et al., 2002). The patients' desire to learn about their health conditions, and the available treatment options, suggests they want to participate in the prescribing decision with their physicians. Involving the patients in the prescribing decision-making process after providing them with needed information about treatment options could result in improved patient treatment experience and satisfaction. It also may result in improved treatment outcomes (Bond, Blenkinsopp, & Raynor, 2012). This partnership between patients and their physicians regarding the prescribing decision is even more important among the elderly. Since the elderly are mostly excluded from the randomized clinical trials that investigate the benefits of preventive medications. These medications are usually prescribed to treat different chronic diseases, such as hypercholesterolemia and hypertension, that are prevalent among the elderly population (Garattini & Chalmers, 2009; Wasson, 2008). Thus, they fail to address important aspects of drug use from the patients' perspective (i.e., side effects, drug-food interactions, medication costs, drug-drug interactions).

Many patients seek information about different drugs that they are taking or will probably be taking in the future from multiple sources including the Internet. Further, studies that assessed the quality of medication prescribing among the ambulatory elderly patients, have indicated many of the prescribed medications were considered inappropriate (Goulding, 2004; Schmader, Hanlon, Weinberger, & Landsman, 1994).

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Although medication prescribing appropriateness was assessed among the elderly in several studies, the patients' perspective regarding their medications was not taken into account (Goulding, 2004; Spinewine et al., 2007). Exploring elderly patients' opinions about their prescription medications can be useful to explain the variation in the medication utilization and adherence among this important segment of the population. This can be attained by asking the patients' about their level of satisfaction with regard to important aspects of medication use (i.e., effectiveness, side effects, ease of use, cost, and drug interactions), and substantiates the need to engage the elderly patients in prescribing decisions.

Today, many federal and private health institutions provide online educational information about different medical conditions and their treatments (i.e., Centers for Disease Control and Prevention, MedlinePlus, Mayoclinic®). However, the information presented on these websites about the different treatments whether invasive (i.e., surgery) or non-invasive (i.e., pharmacological) are merely the same information provided in the medications' leaflets in layman's terms. In an era of empowered consumers, many websites provide the feedback of consumers about different products and services. Hence, patients in multiple online websites evaluate medications and services provided by medical professionals. This gives the patients who are looking for physicians in special practice areas, or are likely to be on a certain medication, the opportunity to view the evaluations and the overall ratings by other patients who had already seen those physicians or are/were on that medication. The factors that influence the patients' opinions of the content and value of these websites have not been investigated. Although patients with higher socioeconomic status might have a favorable opinion of these websites, other factors might also influence patient perception. For instance, patients' quality of life (QOL), a subjective and overarching concept involving multiple dimensions of the patient's life could potentially influence the opinion and value of such websites. Further, in an era of patient-centered care that entails effective communication between the physicians and their clients (patients), it is worthwhile to examine the significance of the relationship between patients' satisfaction with their physicians' communication style and their opinion of such website. Websites browsing may encourage and facilitate the patients' engagement in effective dialogs with their physicians. Patients' beliefs about medications could also affect the value of such websites to patients, since it was found to influence patients' adherence to their medications (Horne & Weinman, 1999).

This study examined the relationship between the older adults' views of online medication rating websites (i.e., Askapatient.com®, Drugs.com®) and:

1. Important aspects of patient-centered care (i.e. attentive listening, quality of conversation, respect, and friendliness).
2. Older adults' quality of life from both the physical and mental perspectives.
3. Older adults' beliefs about medications in general.
4. Older adults' adherence to antihypertensive medications.

1.1.1 Online Health Rating Websites

The implementation of public reporting systems in the United States (U.S.) in the 1980s was mainly driven by the need to improve the quality of care provided by healthcare organizations. These systems generate reports that compare the quality of care provided by different healthcare practitioners. The New York State Cardiac Surgery Reporting System (CSRS), Nursing Home Compare, and the German Kinikfuhrer Rhein-Ruhr are examples of such systems (Emmert, Meier, Pisch, & Sander, 2013; Mukamel & Mushlin, 1998; Mukamel, Weimer, Zwanziger, Gorthy, & Mushlin, 2004; Stevenson, 2006). These systems play a very important role in informing the patients, physicians, and health policy makers about the quality of care of multiple health institutions and healthcare providers. Further, these reports intend to encourage patients to participate in their own care by making informed choices about their healthcare providers, health plans and services (Faber, Bosch, Wollersheim, Leatherman, & Grol, 2009).

Based on the Public Reporting theory, it is generally assumed that patients make an effort to learn about a product, such as a medication, before buying it. This applies to patients who usually search for healthcare services with good quality such as health insurance plans, physicians, and medications (Emmert, Sander, & Pisch, 2013). The advent of the Internet provides a great opportunity for health activists and non-profit consumer protection organizations to design and create information rich websites. These websites contain a wealth of information about a variety of products including healthcare services that customers can utilize to make informed choices (Chen & Xie, 2008; Longo et al., 1997). Nonetheless, these websites along with the public reports provide quality of care evaluation and comparisons across different health institutions and physicians based on clinical and scientific criteria and not from patients' perspective (Emmert, Sander, et al., 2013).

Websites that evaluate physicians and services from patients' perspective are ubiquitous in the Internet. Physicians' rating websites (i.e., RateMDs®, Healthgrades®) are examples that have gained popularity among patients who look for physicians with positive feedbacks from patients. These websites convey important information to both physicians and patients alike. Patients can easily search for specific physicians near their residence with the highest rating. Further, physicians can read patients' reviews and comments about their practices, and try to improve the quality of provided care (Tara Lagu , Hannon, Rothberg, & Lindenauer, 2010). However, critics of such websites list several limitations. First, they do not include all practicing physicians in their databases; merely including 30% of them at best (Emmert, Maryschok, Eisenreich, & Schöffski, 2009). Secondly, most physician rating websites rely only on few patient reviews with few physicians rated by more than five patients (Mostaghimi, Crotty, & Landon, 2010). Thirdly, only a few use validated criteria to evaluate physicians (Reimann & Strech, 2010). Fourth, male physicians, those with board certifications and certain subspecialties (i.e., primary care, obstetrics and gynecology) are more likely to be rated than other specialties such as general surgery (Black, Thompson, Saliba, Dawson, & Paradise Black, 2009) and physicians with malpractice claims are likely to be evaluated and rated negatively (Segal, 2009). Fifth, most contain positive reviews of the listed physicians and

rarely contain negative feedbacks of the rated physicians (Kadry, Chu, Kadry, Gammas, & Macario, 2011). This raises the question of the validity of such reviews since they are provided by anonymous people and the possibility of fraud cannot be excluded (i.e., some physicians can write positive reviews of themselves). Sixth, many physicians question the ability of patients to make sound judgment of their physicians' quality of care. Most patients according to some physicians are not knowledgeable about the clinical skills needed to evaluate the quality of the provided care (Emmert, Sander, Esslinger, Maryschok, & Schöffski, 2012). Taken together, this limits the usefulness of such websites (Emmert, Sander, et al., 2013). However, proponents see in such websites that evaluate not only physicians, but also other healthcare services and products (i.e., psychologists, prescription medications, over-the-counter medications and herbal products) an opportunity to understand patients' views and preferences. Further, their availability may offer a channel for patients to express their opinions in an anonymous and confidential way about the quality of the received care (Trigg, 2011).

Although these websites have several shortcomings and limitations, they can be addressed by taking measures to improve their content and value. For example, a minimum number of ratings/reviews for any physician or product should be determined. Further, the reviews should cover several aspects of care (i.e., satisfaction with the overall care, description of the physicians' communication style). In addition, websites should run security checks to protect reviewers' privacy. Finally, validated quality standards should be followed and word filters should be applied to prevent vulgar words or defamation from being posted (Emmert, Sander, et al., 2013; Segal, 2009).

1.1.2   Medication Rating Websites

Medication rating websites are newly emerged online websites, which have not been researched or reported in the literature before. The information presented on these websites are variable and contingent upon the sponsors as well as the affiliations. For example, the National Library of Medicine provides a useful website (www.ncbi.nlm.nih.gov/pubmedhealth/) about different medications in terms of their routes of administration, dosage forms, indications, brand names, side effects, as well as warnings about drug-drug and drug-food interactions. Further, the major chain pharmacies in the United States (U.S.) like Walgreens® (www.walgreens.com) and CVS® (es.cvs.com/drug/overview) provide useful and valid online information about multiple prescription and over-the-counter (OTC) medications to patients with respect to several aspects of medication use (i.e., indications, dosages, dosage forms, side effects, and food and drug interactions). Some health insurance plan websites, such as Cigna® (www.cigna.com), also offer valid information about different prescription medications to their enrollees. Although, providing valid and detailed information in layman's terms to patients about different medications, they lack, with few exceptions, patient reviews of the medications. Therefore, several independent websites have recently emerged on the Internet offering patients the opportunity to rate their medications as well as to view the opinions of other patients about different medications.

Most of these rely heavily on commercial advertisements, and vary in their content and layout. This can be ascribable to the website administrators or authors, as some are operated by healthcare practitioners or by professional editorial staff, while consumer-reporting agencies manage others. The WebMD® (www.webmd.com) and Drugs.com® (www.drugs.com) are well-known examples of the professionally operated websites that include updated scientific information in both layman's and medical terms about the medications and the health conditions they are prescribed for. Also included are reviews and comparisons of different medications prescribed for similar health conditions by patients in terms of their effectiveness, side effects and patients' satisfaction. Patients can rate their medications on a scale from one to five where one means dissatisfied and five means highly satisfied. Further, they include the prices as well as coupons and patient assistance programs for prescription medications that patients can refer to in case they are needed. In addition, some websites include support groups, where patients can ask questions related to a particular medication that will be answered by a medical expert. On the other hand, websites like DrugRatingZ® (www.drugratingz.com) and AskaPatient® (www.askapatient.com) are operated by consumer reporting agencies that merely include patients' reviews and ratings of different prescription medications with regard to their effectiveness, convenience, side effects, and overall value. The main mission of these websites is to convey to physicians, pharmaceutical industry, and other patients the opinions of the websites users. However, these websites have limitations similar to the physicians rating websites. As with the physicians rating websites, these do not include important information about the reviewers such as sociodemographics, health conditions, number of medications, and prescriber specialties. These issues need to be addressed to improve their value to patients. Overall, medication-rating websites may empower patients to become more engaged in their health care.

1.1.3   Why Geriatric Population?

The growth of the older adult population in the U.S. over the next 50 years is expected to have a tremendous impact on the health care system. The number of older adults is projected to reach 55 million by 2020 as baby boomers age (McGinnis, March 2006). According to the Administration on Aging (AoA), the older population (≥ 65 years) represented 12.9% in 2009, and is expected to reach 19% in 2030 (Administration on Aging). In addition, more than 90% of older adults have at least one chronic medical condition, and 77% have multiple chronic conditions. Chronic diseases such hypertension and diabetes account for 75% of the total U.S. health care expenditure (Schwartz, 2011). The average number of office visits for older adults in 2012 according to the AoA is 7.1; which is twice that for adults between 45 and 65 years of age (U.S. Administration on Aging (AOA), 2012). Further, although seniors (≥ 65 years) do not represent more than 13% of the US population; they consume approximately 34% of the total number of prescriptions per year (Control, 2004). This makes their utilization of the healthcare services higher than any other segments of the population. However, older adults are underrepresented in clinical trials and observational studies as well as in the clinical practice guidelines since they are mostly presented with multiple comorbidities that entail different treatment guidelines (Boult C, 2010; Boyd et al., 2005; Konrat et al., 2012;

Lugtenberg, Burgers, Clancy, Westert, & Schneider, 2011). The current elderly population is more diverse than a decade ago and is likely to be even more diverse in the next decades. It is projected that older adults of the minority population will increase by 217% by 2030 compared with 81% for Caucasian population (Administration on Aging, 2013).

The fact that many older adults are heterogeneous with regard to socio-demographics, medical conditions, severity of illness, personal experiences and preferences, and their quality of life demands flexible approaches in caring for this segment of the population. In addition, since many of the older adults with multiple comorbidities are on multiple medications to keep their chronic illnesses under control, they face "preference sensitive" decisions when their physicians decide to put them on a different medication or add another one. This comes as a result of their increased awareness of the adverse events as well as the possible drug interactions when a new medication is introduced in their medication lists (American Geriatrics Society Expert Panel on the Care of Older Adults with Multimorbidity, 2012). Further, the challenging task that faces almost every patient in general and particularly the elderly, is the adherence to their prescription medications. Medication adherence is more challenging for older adults compared to the younger populations due to their tendency to forget as well as their long medications lists (E. J. MacLaughlin et al., 2005). Thus, empowering elderly patients should be one of the utmost priorities of any physicians in general, and the primary care providers in particular since they are the gatekeepers in any successful health care system (American Geriatrics Society: American Geriatrics Society Expert Panel on the Care of Older Adults with Multimorbidity, 2012). The patients' empowerment would hopefully make the elderly patients feel that they are involved in their own care since their participation is pivotal in the success of any disease management plan (Schwartz, 2011).

1.1.4   Physicians' Communication and Interpersonal Skills

As the practice of medicine evolved over time, physicians felt that the success of any disease management plan depends on the patients themselves. Thus, a new principle in health care known as patient autonomy and patient-centered clinical practice was ushered in (Chin, 2002; Rodriguez-Osorio & Dominguez-Cherit, 2008). This necessitates that the current and future physicians be equipped with new skills that enable them to address the needs of the patients in general and the elderly in particular since elderly patients are usually presenting with multiple health conditions. Hence, many physicians have started adopting a patient centered practice model instead of the traditional paternalistic practice model that prevailed for decades (R. Baker, 1999; American Geriatrics Society Expert Panel on the Care of Older Adults with Multimorbidity, 2012). This model takes into consideration the patients' experiences and insights that are believed to be relevant in the medical decision-making process (Charles, Gafni, & Whelan, 1997). Understanding the patients' needs and concerns will likely have a positive impact on both the clinical outcomes as well as on the participant-reported outcomes (PROs) (Falkum & Førde, 2001; Roumie et al., 2011).

Elderly patients are not different from any other segment of the patient population in their desire to be involved in their own care. However, elderly patients are heterogeneous in their medical and personal characteristics. Further, their definition of involvement is different from the younger patient population who tend to participate more in the decision making process (Coulter, Parsons, & Askham, 2008). The elderly patients' definition is more centered on "receiving information", "patient-centered approach", and "caring relationship" (Bastiaens, Van Royen, Pavlic, Raposo, & Baker, 2007). Therefore, physicians need to have effective communication techniques in order to initiate constructive dialogs with their patients that enable them to elicit the patients' concerns and needs. Skills like attentive listening, speaking slowly, providing simplified medical information, being empathic, and making informed decision based on patients' needs and preferences are all important attributes of effective communication that physicians should possess (Duffy, Gordon, Whelan, Cole-Kelly, & Frankel, 2004; Travaline, Ruchinskas, & D'Alonzo, 2005). Effective communication and interpersonal treatment are integral in any therapeutic treatment plan, since it does not only address the physical aspect of the disease, but also addresses the psychological aspect of it (Travaline et al., 2005). Further, evidence suggests that effective patient-physician communication is correlated with improved patient health outcomes, lower health-related costs, reduction in the number of emergency department visits, improvement in the quality of life, medication adherence, and higher patient satisfaction (Stewart, 1995; Travaline et al., 2005).

However, in the real world many physicians are ineffective communicators, putting more pressure on patients to initiate constructive dialogs with their physicians that will ultimately serve both providers and patients. Thus, patients' empowerment tools such as educational television (TV) programs, public awareness programs, online patients' educational websites (i.e., Medline®), and even TV and online drugs ads may encourage patients to discuss with their physicians the signs and symptoms of certain medical conditions they may have as well as exploring possible treatment options (Jacob, 2002; Van Woerkum, 2003). The advent of the Internet has revolutionized the provision of health information to the public. Today, patients can surf it and find hundreds if not thousands of health education websites that provide a wealth of information about almost any known disease. However, little is known about the value of such websites to patients in general and to elderly patients in particular in improving the patient-physician communication. Such websites may empower elderly patients who usually play a passive role when communicating with their physicians.

1.1.5 Patients' Quality of Life

Patients' health-related quality of life (HRQoL) is one of the patient-reported outcome measures (PROMs). Unlike the clinician-reported outcomes (ClinROs) that measure the effectiveness of the treatment (i.e. Hb1Ac, BP), the PROMs are mostly self-completed questionnaires, which can be completed by the patients themselves or by others on their behalf in structured interviews (Meadows, 2011). Quality of life (Qol) is a subjective multidimensional concept that involves several domains of life and assesses the impact of a treatment intervention, health conditions or employment status on the

individual's life from their perspective. The physical, material, social, productive, emotional and civic well-being are the main domains of life that fall under the quality of life umbrella (Felce, 1997). This concept can also be concisely defined as "the satisfaction of an individual's values, goals and needs through the actualization of their abilities or lifestyle" (Emerson, 1985, p. 282). Hence, personal satisfaction, life conditions, and quality of life are inseparably intertwined concepts (Felce & Perry, 1995).

The quality of life is variably defined across and within different groups of the population. For instance, the elderly people describe their quality of life differently compared to younger individuals. Multiple factors lead to this variation in the elderly's definition of this subjective concept. As people age, they face several physical and emotional limitations making their life experience very different. Further, due to the subjectivity of the quality of life concept, elderly people differ in their opinions of their quality of life even if their health and socioeconomic status are similar. Thus, some elderly people describe their lives as full of joy and happiness, whereas others feel their lives are depressing and miserable. The variability in describing quality of life among the elderly can be ascribable to the way elderly people interpret their losses, personality type, sets of belief, stress coping strategies, strength of family and social networks, economic status, health conditions, and functional ability (Wilhelmson, Andersson, Waern, & Allebeck, 2005; Xavier, Ferraz, Marc, Escosteguy, & Moriguchi, 2003).

Besides the subjective and objective factors considered as determinants of the individual's quality of life, other factors might also shape a person's perception of their quality of life. In an era of high technology, the Internet transformed many parts of our lives including the way we communicate with each other (i.e. Email, Facebook®, and Twitter®). The U.S. is one of the top countries in the world in terms of the number of the subscribers to Internet services, with a percentage over 70% (Stats, 2012). This was found to have a significant impact on quality of life (Albarran & Goff, 2000; Cairncross, 2001; DiMaggio, Hargittai, Neuman, & Robinson, 2001). People with weak social ties and poor communication skills as well as the elderly can expand their acquaintances and gain a wealth of knowledge through online connection. Further, the use of online forums, counseling, and news can enhance self-sufficiency, psychological empowerment, and rehabilitation (Leung, 2010). Also, Internet use among older adults is associated with lower perceived life stress, improved psychological well-being, self-confidence, and higher personal satisfaction with social relations including family members and friends (Leung, 2010; Liang, 2011).

Today, many patients turn to the Internet to share their illness experiences with their illnesses with other patients through self-created personal blogs. Others use certain websites that facilitate communication with other patients who have the same health conditions. Such websites help reduce the feeling of depression and loneliness among patients in general and those with serious health conditions in particular (Klemm et al., 2003). However, little is known about the recently developed websites that ask patients to evaluate and rate their physicians or their treatment regimens and whether they have any impact on their personal quality of life.

Finally, although several studies have investigated the effects of the Internet on the people's quality of life, studies that examined the effect of the Internet services on the quality of life are rare (Liang, 2011).

1.1.6 Patients' Beliefs about Medications

People vary in their beliefs about medications. Some have negative views of medications in general regardless of their origin. However, others have positive views of alternative medicine (i.e. medications from natural origins) and not of western medicine (i.e. prescription medications). Their views and beliefs about medications are influenced by multiple factors such as age, gender, race, cultural background, and experience with taking prescribed medications (Horne et al., 2004). For instance, Asians are more likely to believe in herbal medicine effectiveness in treating most of the common diseases compared to people from European descent.

The importance of the patients' beliefs about medications stems from the fact that the success of any disease management plan depends largely on the level of patients' adherence to their treatment regimens. Medications' adherence is significantly associated with medication beliefs. Thus, patients with negative views about medications were more likely to report low adherence levels to their medication regimens compared to those with positive views (Gatti, Jacobson, Gazmararian, Schmotzer, & Kripalani, 2009). Further, research has shown that medication beliefs are more powerful predictors of patient-reported medication adherence than clinical and sociodemographic factors (Horne & Weinman, 1999). Medication beliefs affect patients' adherence to medications prescribed for many acute and chronic illnesses. Asthmatic, the renally compromised, oncology, and cardiac patients are some of patient subpopulations in which medication beliefs were found to affect patient adherence to prescribed medication regimens (Conn, Halterman, Lynch, & Cabana, 2007; Horne & Weinman, 1999). Patients tend to be more adherent to their prescribed medication regimens when the perceived necessity of these medications exceeds their perceived harmfulness (Aikens, Nease, Nau, Klinkman, & Schwenk, 2005). Further, those with multiple comorbidities and functional limitations are more likely to believe that the benefits of taking medications to manage their health conditions outweigh their risks (Schüz et al., 2011). Older adults are more likely to have chronic health conditions as well as more physical limitations than their younger counterparts are. Therefore, older age was significantly associated with positive beliefs about medications (Aikens, Nease, & Klinkman, 2008).

Another important factor that influences patients' beliefs about medications is the physicians' communication style. Patients who were satisfied about their physician's communication style held positive views about their own medication regimens and were more likely to be seen by their physicians for a follow-up visit (Bultman & Svarstad, 2000). Although age, culture, health conditions, and physicians' communication style have shown to impact patients' beliefs about medications, the impact of other important factors on medication beliefs have not been investigated yet. For example, in an era where patients can access an immense amount of health information with the click of a

mouse, no one knows if the information encountered online would change their beliefs about medications. Further, it is also unknown if the online-posted reviews and ratings of medications by patients would influence the physician-patient communication style of those who browsed such websites.

1.1.7 Medication Adherence

The prescribing of medications is the most common and effective healthcare intervention. However, even though most of the prescription medications are effective in managing many health conditions, 30-50% of these medications are not taken as recommended (Banning, 2009). Medication adherence is a complex and interesting psycho-behavioral issue which has been defined as "the extent to which the patients' behavior matches agreed recommendations for the prescriber" (Horne, 2005, p.27). Multiple factors can influence patient adherence. Patients' cultural background, social support, medical status, age, gender, and beliefs about illnesses and medications are some of these factors that might influence patient's adherence to prescription medications (Banning, 2009; Horne & Weinman, 1999). Health and medication beliefs are considered one of the strongest predictors of medication adherence among patients in general and those on chronic or multiple medications in particular (Phatak & Thomas, 2006). Therefore, understanding patients' beliefs about health and medications is of paramount significance to address medication non-adherence. Further, low patients' satisfaction with their treatment has a negative impact on their adherence to prescription medications (Sa'ed, Al-Jabi, Sweileh, & Morisky, 2013). In addition, low patients' health-related quality of life is another barrier to achieving high medication adherence (Holt, Muntner, Joyce, Webber, & Krousel-Wood, 2010).

Although medication non-adherence is prevalent among multiple patient populations, it is an increasing problem among older adults. This can mainly be attributable to multiple comorbidities that elderly patients usually suffer from as well as the complexity of their medication regimens. Further, the declining cognitive abilities, dexterity problems, poor physician-patient communication, and high risk of adverse drug events are additional factors that can lead to non-adherence and are common among elderly patients (Macías-Núñez et al., 2008). Thus, the elderly patients are at higher risk of adverse drug events, medication mismanagement, and poor health outcomes. This is particularly true in older adults with chronic health conditions such as hypertension and diabetes that require long-term management (Banning, 2009). For example, it was estimated that 10% of the unplanned admissions among older adults were related to adverse drug events (Pearson, Skelly, Wileman, & Masud, 2002). Therefore, managing poor medication adherence among the elderly patients requires good communication between the patients and their physicians. Physicians need to form a therapeutic alliance with their patients whereby patients can share their concerns and beliefs about medications as well as their treatment preferences (Pound et al., 2005). Unfortunately, physicians tend to spend less time with the elderly patients despite the fact that they require additional time for giving and receiving information (Radecki, Kane, Solomon, Mendenhall, & Beck, 1988). Hence, older adults should be empowered to start

constructive conversations with their physicians where they can express their needs and concerns about the prescription medications as well as their preferences.

Education is power and a key approach in tackling the issue of non-adherence among patients. Thus, providing patients with information about their health conditions and the pros and cons of different available treatment options may improve their medications adherence. It also facilitates partnerships with their physicians in managing their health conditions (Banning, 2009). Nonetheless, given the short visit length, long medication lists, and the need to educate and follow up with elderly patients; new and creative ways of communication between physicians and patients should be developed. In an era of high technology, the Internet has become one of the new avenues that physicians use to communicate with their patients. Physician's communication with their patients through secure websites can help physicians understand patients' beliefs and adherence barriers. Further, physicians can use these websites to assess the patients' progress and update their treatment regimens accordingly. Such online interventions had a positive impact on patients' medication adherence levels (Linn, Vervloet, van Dijk, Smit, & Van Weert, 2011). However, the use of Internet is not limited to the communication between physicians and their patients. Many health websites are competing in providing health-related information about multiple health services and medications in layman's term (Jenkins & Dunn, 2004). These websites differ in their content, design, and affiliations. Some of these websites provide patients reviews of medical devices, physicians, and medications (Emmert, Sander, et al., 2013).

Online health information seeking was seen to help patients initiate constructive dialogs with their physicians, and improve their satisfaction with provided care (Bylund et al., 2007; Jacob, 2002). However, it is unknown whether the websites that provide patients' reviews of medications will enhance patient-physician communication, and eventually improve patients' medication adherence levels.

1.1.8 Why Hypertensive Patients?

As people age, they become more susceptible to chronic diseases such as hypertension and diabetes (Abrass, 1990). Essential hypertension is an asymptomatic chronic medical condition that is highly prevalent among the older adults especially among women and minorities. According to the latest report published by the Centers for Disease Control and Prevention, the prevalence of hypertension among older adults who are between 65 to 74 years of age approximates 65%, and among those over 75 years approximates 75% (Hamilton, 2003; *Health, United States, 2012: With Special Feature on Emergency Care*). It has been estimated that hypertensive patients are two times more likely to develop coronary artery diseases, three times more likely to have cerebrovascular diseases, and 3.5 times more likely to have heart failure at some point in their life when compared to the non-hypertensive population; and the likelihood of developing such serious illnesses increases with age (Kannel, 2003). Further, it is estimated that more than 60% of the older adults with hypertension had an incident of myocardial infarction, stroke, and/or heart failure (Lloyd-Jones et al., 2009). According

to one study, the death rate attributable to hypertension among older adults (≥60 years) is 735 cases per 100,000 people (Mensah, Mendis, Greenland, & MacKay, 2004). Further, hypertension often represents a management dilemma to cardiovascular specialists because of the multiple physiological and behavioral factors that eventually determine the success of any treatment plan (Lionakis, Mendrinos, Sanidas, Favatas, & Georgopoulou, 2012).

Although hypertension is considered a significant risk factor for cardiovascular diseases, the good news is that it is a modifiable risk factor. Patients who adhere to their antihypertensive medication regimens, which include both the pharmacological and the non-pharmacological measures, are likely to bring their blood pressure under control. Therefore, their risk of developing serious diseases such as myocardial infarction or stroke in the future will eventually be diminished (Sacco et al., 1997). To reach that goal, both patient and physician need to have a collaborative agreement where each one of them understands his/her roles and responsibilities. This agreement should also respect each party's expectations and values. Unfortunately, some evidence indicates that healthcare professionals treat their elderly patients in a condescending and impatient manner (Harwood, 2007; Nussbaum & Coupland, 2004). Further, physicians seem to spend less time , provide less information, and often fail to stress the importance of the non-pharmacological preventive measures (Greene & Adelman, 2001; Harwood, 2007). Finally, physicians should adopt effective communication strategies to build a constructive collaborative agreement with their hypertensive patients in order to achieve the desirable treatment outcomes and prevent future complications.

1.2   Study Objectives and Research Questions

The value and usefulness given to online patients' ratings of medication websites by older adults about the process of patient-physician communication (i.e., facilitating the communication, discussing the content of these websites with their physicians, asking their physicians to prescribe the top rated medications) can be associated with multiple factors. Thus, the following were studied:

1. Are the online medication reviews viewed more favorably by those who are satisfied with their communication with physicians and will the older adults' rating of their own treatment regimen influence their satisfaction with communication with physicians?
2. Do older adults with high quality of life scores have favorable views of the online medication reviews in comparison to those with lower quality of life scores and will the rating of their treatment regimens influence their quality of life?
3. Do older adults with positive beliefs about medications find the online medication reviews useful in comparison to those with negative beliefs and will the rating of their treatment regimens influence their medication beliefs?

4. Do older adults' adherence to their antihypertensive treatment regimen influence their views of the online medication reviews and do older adults' rating of their antihypertensive medication regimens influence their medication adherence and their views of the online reviews of medications?

1.3 Theoretical Framework

In order to understand how the online medication reviews can affect certain indicators of health outcomes, such as the quality of life and medication adherence, the Donabedian model was used to evaluate how these factors are interrelated. The Donabedian model is a conceptual model proposed by Avedis Donabedian, a physician and health care services researcher at the University of Michigan, in 1966. The purpose of this model was to provide a framework to assess the quality of health care services and relate that to the ultimate outcomes such survival, blood pressure reduction, and A1C improvement (Donabedian, 1966). According to the Donabedian model, the measurement of the health care quality should be based on three main components: Structure, Process, and Outcomes. Each of these components has a direct influence on the next one starting from the Structure, then the Process, and finally Outcomes (Donabedian, 2005). To apply this model to the study, physician education and training to communicate effectively and address the needs and concerns of the elderly patients represents a Structure component. Whereas, the appropriateness of the diagnosis and prescribing as well as the communication style and interpersonal aspect of the relationship between the physicians and their patients which can be influenced by their medical, cultural, and religious beliefs are Process components. Finally, patient's satisfaction with care, quality of life, and medication adherence considered indicators of health status are Outcome components, as is, patient beliefs about medications since effective communication can influence patient beliefs about medications and eventually affect patient adherence. However, to know the value of the online patients' medications reviews in facilitating patient-physician communication as well as its relationship with health status indicators; it is believed that the online patients' medication reviews can be considered as an intervention directed towards the Process component (i.e. facilitating the patient-physician communication)(Friedman et al., 2008) **(Figure 1-1)**. Although, the online reviews of medications can influence patient-physician communication and indirectly affect outcomes (i.e. satisfaction with physicians, quality of life, beliefs about medications, and medication adherence), the same outcomes can also influence patients' opinions of such online websites **(Figure 1-2)**.
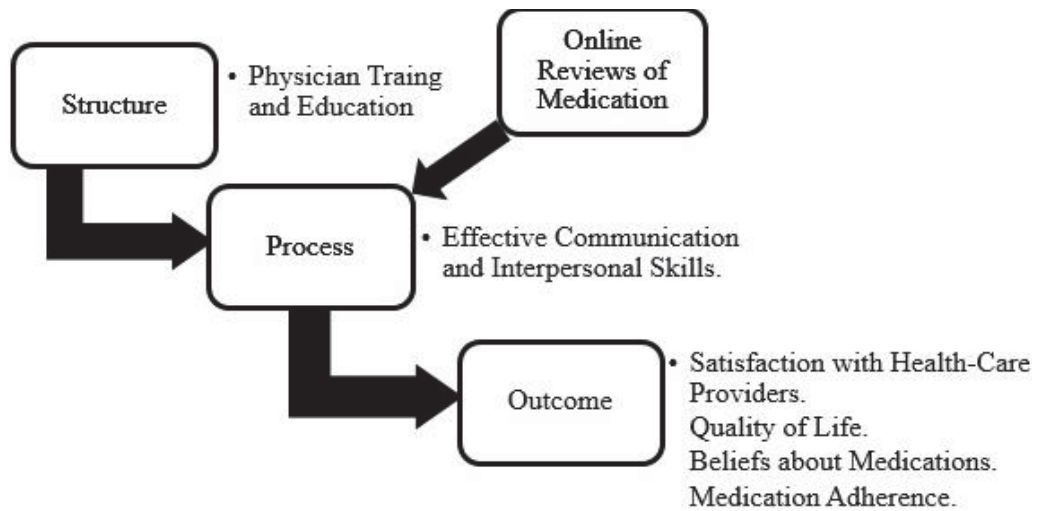
Figure 1-1.   The potential effect of online reviews of medications on physician-patient communication.

Source: Donabedian A, Evaluating the Quality of Medical Care. Milbank Quarterly 2005 December; 83(4): 691-729.
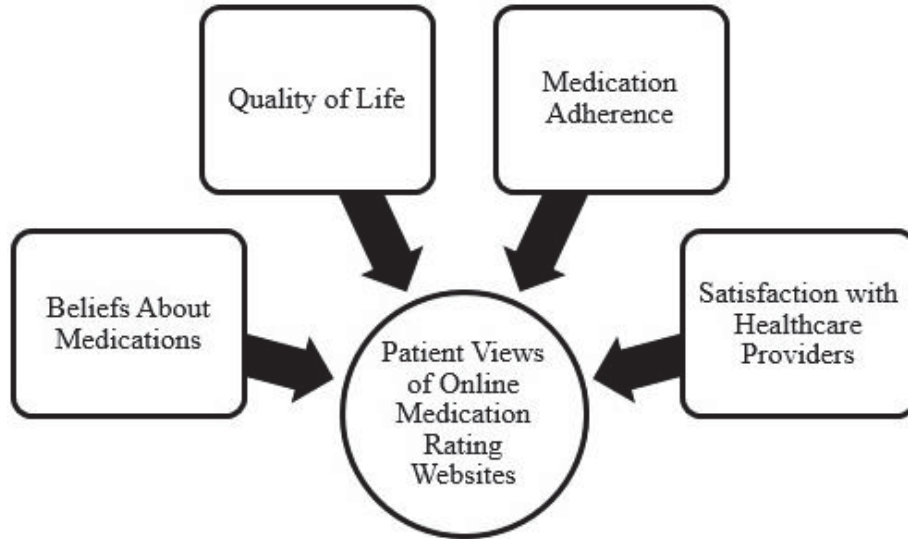
Figure 1-2. **Factors that may influence patient views of online medication reviews.**

CHAPTER 2.   LITERATURE REVIEW

2.1   Physician-Patient Communication

There is a belief that effective communication is both essential and lacking among physicians (Stein, 2006). A review of physician-patient communication by Persaud showed only 5% of the clinical consultations provided by physicians to patients were considered to be friendly or social (Persaud, 2005). Some argue that the deterioration in the physician-patient relationship or encounter probably came after the infiltration of corporate interests in the U.S. healthcare system, which resulted in diminished trust between the physicians and patients (Laugesen & Rice, 2003). Furthermore, the main reason patients sue their physicians for malpractice is not because of their negligence, but for the lack of respect and ineffective communication from the physicians' side (Levinson, Roter, Mullooly, Dull, & Frankel, 1997). The quality of physicians' communication skills has been found to be a positive predictor of patient adherence with medical advice (Robins & Wolf, 1988). Hence, there seems to be a consensus among physicians and policy makers alike to adopt a patient-centered approach where patients are involved in their own care as partners with their physicians and not solely as receivers of care. Bensing (Bensing, 2000) and Mead, Bower, and Hann (Mead, Bower, & Hann, 2002) summarized the basic elements of patient-centered practice as follows:

- Attending to patients' psychological and physical needs,
- Encouraging patients to disclose their concerns,
- Conveying a sense of partnership during the consultation sessions, and
- Actively facilitating the involvement of patients in the decision making process.

Thus, the provision of patient-centered care requires collaboration between all personal, professional, and organizational levels in healthcare. This can only be achieved through education and training of physicians that show friendliness and empathy in their conversations with patients and create a supportive environment and system that rewards those physicians who foster and provide patient-centered care for patients (Epstein & Street, 2007; Epstein, Fiscella, Lesser, & Stange, 2010; Epstein & Street, 2011). Hence, structural changes need to be implemented in the healthcare system to strengthen the relationship between physicians and patients, and promote the communication between them in order to make the physician-patient encounter an enjoyable and informative experience that eventually leads to a constructive partnership between patients and physicians (Epstein & Street, 2011).

To build that partnership both patients and physicians need to agree on the goals and tasks of the treatment plan and act upon them. By doing so, they form what is currently known as a "Working Alliance." This term has been studied extensively in the last few decades and it encompasses a wide array of cognitive and emotional factors that need to be included in this partnership (Boylan & Fontanella, 2009). A good therapeutic working alliance consists of the following (Bordin, 1979):

- Agreement on goals,
- Assignment of tasks, and
- Development of an effective bond between the physicians their patients.

This working alliance between the physicians and patients cannot succeed without a genuine effort made by the physicians to involve the patients in this partnership. Engaging patients in their own care is not by any means an easy task and only those with a good communication style and interpersonal skills can succeed (Brennan, Rivera-Tovar, Martin, Hepworth, & Makoul, 2010). A sense of connection and mutual understanding has to exist between the physicians and patients in order to have an effective and meaningful communication. Otherwise, the physician-patient communication will merely be an exchange of medical information divorced from the context and complexities of the patient's life.

Empathy is regarded by most researchers in the domain of patient-centered care research as one of the most important interpersonal skills that healthcare professionals need to learn to effectively communicate with their patients (Boylan & Fontanella, 2009). It has been variously defined by researchers in the field of psychotherapy; however, what is common between these definitions is that they all capture the importance of deep listening and objective understanding of patients' experiences (Davis, 1994). Empathy in the physician's communication with their patients was found to have a positive impact on overall patient care (Kim, Kaplowitz, & Johnston, 2004; Larson & Yao, 2005). Whereas, an indifferent physician-patient relationship was found as one of the factors behind poor medication adherence (Osterberg & Blaschke, 2005). There are other verbal behaviors known to promote the physician-patient relationship especially among the elderly. Physicians' friendliness, attentive listening, and encouraging patients to ask questions are very important attributes of effective communication (Beck, Daughtridge, & Sloane, 2002; Zachariae et al., 2003).

2.1.1 Theoretical Models of Physician-Patient Relationship

Parsons (1951); a sociologist, provided a description of the physician-patient relationship. His description was later called "Parsons' model of sick role and physician's role," whereby sick people are in need of care that is provided to them by specialized personnel. The specialized personnel are in most cases physicians, and because patients need that care they must cooperate with their physicians and forgo some of unhealthy activities, they were used to in order to recover quickly. According to Parsons' model, patients regardless of their medical conditions, gender, age, ethnicity, and culture, are expected to assume the sick role. Parsons also believed physicians should apply their clinical skills and knowledge for the benefit and welfare of patients and the whole community and not for their narrow financial interests (Parsons, 1951). However, this model has received a number of criticisms. The model assumes that the patients will voluntarily accept the sick role without any objections and will fully cooperate with their physicians. Further, it assumes a consistent physician-patient relationship whereby patients from different backgrounds and lifestyles will be treated the same. In addition, it puts most of the blame on patients who play the sick role for their illnesses. In reality,

physicians' counseling and advice along with their treatment plan are highly important. Parsons' model may fit acute illnesses (i.e. measles, appendicitis, malaria); however, it does not fit chronic medical conditions such as hypertension, hypercholesterolemia, and diabetes where patients' participation in the treatment decision is very important (Jeffery, 1979; Macintyre, 1994; Morgan, 2003). Existing models that describe this relationship fall into one of the following (Charles et al., 1997; Clarke, Hall, & Rosencrance, 2004; Emanuel & Emanuel, 2000; Morgan, 2003):

- **The Paternalistic (Parsonian) Model:** A model in which physicians have the upper hand over patients when it comes to the decision making process regarding the treatment plan. Many consider this relationship similar to one between a parent and child.
- **The Engineering (Informative or Consumerist) Model:** In this model patients assume the active role, whereby physicians are hired by patients to relay the medical facts and information requested by the patient and then implement the treatment decision made by patients after explaining the variety of treatment options.
- **Interpretive Model:** A contractual model in which both patients and physicians forge an agreement whereby physicians work with patients as partners in the decision making process concerning their health and treatment plan provided that their moral integrity is kept intact. The principles of autonomy, fidelity, veracity, do no harm, and justice should form the basic elements in this contractual relationship. Physicians try to understand patients' values and behavior and come up with individualized treatment plans that fit patients' values and beliefs. This model assumes that patients usually are not clear about what would be the best diagnostic tests and/or treatment options for them. For this reason, discussions between physicians and patients will help patients decide which test or treatment would fit them best.
- **Deliberative Model:** Instead of trying to understand the patients' values and beliefs in order to devise an individualized treatment plan, physicians explain to patients the different diagnostic and treatment options; try to persuade the patients about the best options, and finally leave the decision to patients.

When it comes to clinical reality, none of these models will work all the time regardless of the medical condition, its urgency, and patients' backgrounds.

2.1.2   Physicians' Consultation Styles

- **Physician-Centered Consultation:** Represents the paternalistic (Parsonian) model whereby physicians have the upper hand in their relationships with their patients. According to this consultation style, patients should obey and cooperate with physicians in order to reach the desirable outcome. It focuses on the physical aspects of the disease and

ignores the feelings and emotions of the patients (Mishler, 1984; Morgan, 2003).

- **Patient-Centered Consultation:** Physicians adopt a less controlling style and encourage patients to participate in the consultation. Physicians spend more time listening to patients and paying attention to the patients' feelings and emotions. This consultation approach can represent either the interpretive or the deliberative contractual (collaborative) models (Mishler, 1984; Morgan, 2003).The basic characteristics of this consultation style can be summarized in the following (Mead & Bower, 2000):

  - **Biopsychosocial Perspective:** Physicians are willing to become involved in all the difficulties patients are going through and not just their medical condition.
  - **Patient-as-a-Person:** Physicians want to listen and understand patients' medical conditions from the patients' own perspective and use open-ended interview questions.
  - **Sharing Power and Responsibility:** Patients are treated as a partner in this contractual or collaborative relationship with physicians; hence, they are encouraged to participate in the consultation.
  - **Therapeutic Alliance:** Patients should be involved in the treatment decisions.
  - **Physician-as-a-Person:** Physicians are human beings and not machines so they should recognize and respond to patients' cues.

2.1.3   Communication with Older Adults

Older adults mostly desire more information about their medical conditions and medications from their physicians, however, research has shown that they receive less information than younger patients (Beisecker, 1988). This can be partly due to the fact that older patients tend to communicate less effectively when they sense that physicians are rushed or uninterested (Robinson, White, & Houchins, 2006). This becomes more complicated when it is known that the average consultation time is around six minutes with the actual length of time between 2 to 20 minutes. This can potentially lead to less attention paid to the psychosocial aspects of patients' disease and more attention to its physical nature. Eventually more medications are prescribed and fewer psychological problems are identified (Daschle, Domenici, Frist, & Rivlin, 2013; Morgan, 2003).

Older patients revere their physicians and want to spend quality time with them to understand their health conditions better and verbalize their concerns. Hence they need an attentive physician who makes them feel they are important (Robinson et al., 2006). However, one of the most common complaints patients have about physicians is that they do not listen and frequently interrupt them (Meryn, 1998). Physicians sometimes avoid listening to patients not just because of the time constraints, but also because they do not

want to distress themselves by listening to patients' concerns and do nothing about them (Ekdahl, Hellström, Andersson, & Friedrichsen, 2012; Ha & Longnecker, 2010). Older patients' non-adherence to physicians' advice and prescribed treatment can be greatly reduced by attentively listening and reducing the amount of distractions (Dreher, 2001). Besides the attentive listening, older patients appreciate the medical advice and information conveyed to them by physicians. Given the natural aging process that may involve sensory loss, decline of memory, and impaired hearing, physicians need to simplify their language by avoiding medical jargon and by talking slowly and loudly (Howard, Jacobson, & Kripalani, 2013; Robinson et al., 2006).

2.1.4 Factors Influencing Physician-Patient Communication

Factors that can influence physician-patient communication are numerous, but little has been published about the potential factors that can be summarized into four domains: patient communication style, sociodemographic factors, health-related factors, and physician communication style (Morgan, 2003; Street Jr, Gordon, & Haidet, 2007; Strull, Lo, & Charles, 1984) **(Figure 2-1)**. Each of these domains has the potential to shape the communication between physicians and patients.

2.1.4.1 Patient Communication Style

This domain covers how much information patients want to receive from and discuss with physicians about their medical conditions, their willingness to share and express their concerns and feelings, and their decision-making preference. Patients with negative beliefs about healthcare (i.e., distrust in modern medicine or fear of the healthcare system) have a different communication style than those with positive beliefs (Ha & Longnecker, 2010). For example, patients with positive views of healthcare tend to be more inquisitive and open (i.e., ask questions, assertive about getting answers, and express their fears and concerns to their physicians) than those with negative views of healthcare. Therefore, patients with positive are more likely to receive supportive, informative, and accommodating care (Ha & Longnecker, 2010; Street Jr et al., 2007). Further, patients' preference towards the decision making process (i.e., whether they like their physicians to make the decision on their behalf, have a shared decision, or make the decision themselves) is another important factor that influences patients' communication style. Patients' preferences are dependent on factors that fall under the other domains such as health literacy, education, and age (Schneider et al., 2006).

2.1.4.2 Patient Sociodemographic Factors

Researchers have shown that as patients age, they become less interested in participating in the health decision-making as well as less inclined to engage in effective communication with their physicians (Garfield, Smith, Francis, & Chalmers, 2007;
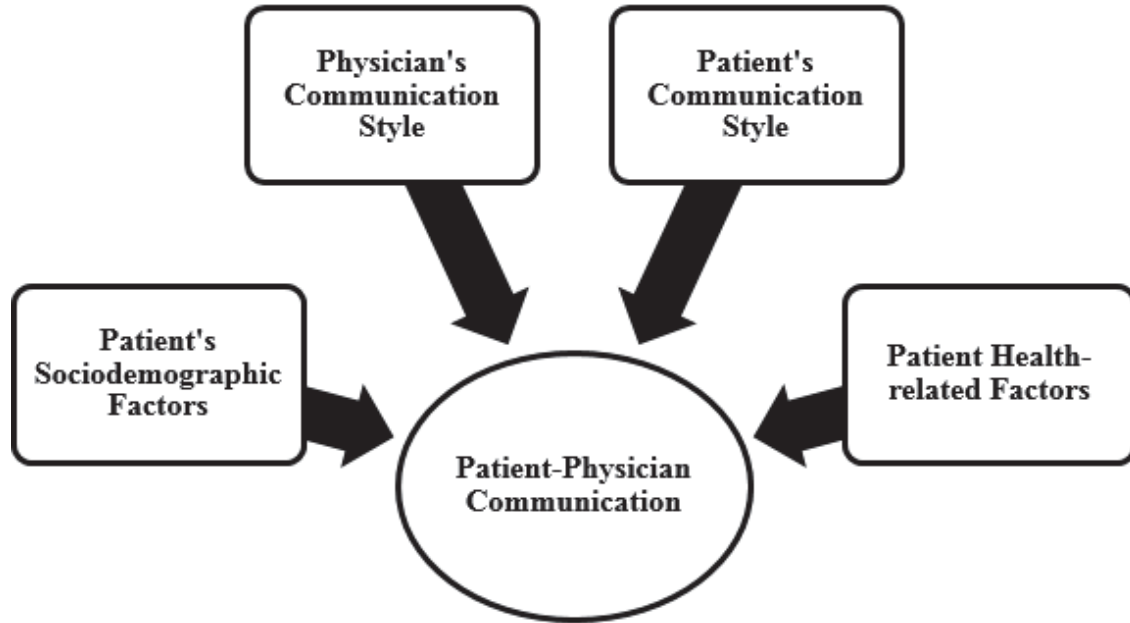
Figure 2-1.   Factors influencing physician-patient communication.

Source: Reprinted from Social Science and Medicine, 65(3), Street Jr, Gordon & Haidet, Physicians' communication and perceptions of patients: is it how they look, how they talk, or is it just the doctor?/Figure 1, 586-598, 2007 Jan, with permission from Elsevier.

Morgan, 2003; Robinson et al., 2006; Schneider et al., 2006). Paradoxically, one study found that older patients are more likely to be satisfied with the care provided (Carlin, Christianson, Keenan, & Finch, 2012). Patients of high educational and social status were more likely to engage in the consultation by asking questions and inquiring about other treatment options in comparison to patients with a lower socioeconomic status (Garfield et al., 2007; Morgan, 2003; Schneider et al., 2006). However, highly educated patients were also found to be less satisfied with care compared to patients with a lower educational status (Carlin et al., 2012). The association between gender and patients' preference for involvement in the decision-making process is variable (Garfield et al., 2007). Females are more interested than males in having a participatory role as well as more satisfied with the care provided (Arora & McHorney, 2000; Carlin et al., 2012; Levinson, Kao, Kuby, & Thisted, 2005; Nease Jr, 1995). Other studies show no significant association between gender and patients' preference for decision sharing with physicians (Florin, Ehrenberg, & Ehnfors, 2006; McKinstry, 2000). Race is another potential factor that can play a major role in patient preference for decision sharing with physicians (Strull et al., 1984). Whites are more likely to believe in patients' autonomy than other minorities (Garfield et al., 2007). The role of patients' insurance status was not well described, however, patients enrolled in an HMO (Health Maintenance Organization) were found to request more information from their physicians than patients with a different type of insurance coverage (Strull et al., 1984). In another study, insured patients were more likely to be satisfied with the provided care than those who are uninsured (Carlin et al., 2012).

2.1.4.3 Patient Health Related Factors

Patient disease severity was negatively associated with the desire to have an active role in both communication and decision sharing with few exceptions (Garfield et al., 2007). Patients with acute illnesses have been found to seek more information about their medical conditions from their physicians, but at the same time preferred a passive role when it comes to decision making (Wilkinson, Khanji, Cotter, Dunne, & O'keeffe, 2008). Patients with more chronic illnesses report higher satisfaction with the health care provided and their physicians' communication style (Carlin et al., 2012). Further, patients vary in their preference for the decision sharing based on their medical condition. Patients with heart failure were found to have a passive role in decision-making process, whereas older patients with serious mental illness were more likely to be involved in the decision-making than their younger counterparts (O'Neal et al., 2008; Rodriguez, Appelt, Switzer, Sonel, & Arnold, 2008). Furthermore, patients with breast, prostate, colorectal, lung, gynecological and other cancers had a strong desire to be involved in the decision-making process regarding their treatment (Bruera, Sweeney, Calder, Palmer, & Benisch-Tolley, 2001; Tariman, Berry, Cochrane, Doorenbos, & Schepp, 2010).

2.1.4.4 Physicians' Communication Style

Some physicians adopt a physician-centered approach where they control the direction of the communication during the physician-patient encounter and decide what

treatment they deem appropriate with no patient involvement. This model referred to as the Parsonian or paternalistic model is widely practiced by many physicians. Others practice patient-centered care, where they listen attentively and involve patients in treatment decision. In this model, physicians share the treatment decisions with patients by explaining different treatment options, and letting the patients decide afterwards what treatment option would be the best for them (Morgan, 2003; F. A. Stevenson, Barry, Britten, Barber, & Bradley, 2000) **(Table 2-1)**. However, to understand why physicians choose to practice physician-centered or patient-centered care, one has to consider several factors that can influence physicians' communication style. For instance, physicians' prior experiences with patients may influence the physician communication style along with gender, cultural background and medical training (Street Jr et al., 2007; Zandbelt, Smets, Oort, Godfried, & de Haes, 2006; I Gouni-Berthold MD & Berthold, 2012).

2.2　　Linking Patient-Centered Care to Health Outcomes

Patient experience with care is increasingly gaining ground to become an integral element or even one of the important pillars of the quality of healthcare along with patient safety and clinical effectiveness (Doyle, Lennox, & Bell, 2013). Patient-centered care has been defined as "the experience (to the extent the informed, individual patient desires it) of transparency, individualization, recognition, respect, dignity, and choice in all matters, without exception, related to one's person, circumstances, and relationships in health care" (Berwick, 2009, p.560). Currently, there is a sort of consensus among the advocates of patient-centered care that a good outcome should be defined based on how meaningful and valuable this outcome will be to patients themselves, not solely to physicians or policy makers (Guyatt, Montori, Devereaux, Schünemann, & Bhandari, 2004). Since the provision of patient-centered care encourages patients to participate in the discussion with physicians and get involved in their own care, it should be expected to see higher adherence, improved quality of life, and better clinical outcomes across a wide range of medical conditions (Berwick, 2009; Street Jr, Makoul, Arora, & Epstein, 2009). However, past research shows inconsistent findings about the impact of patient-centered care on health outcomes (Lee & Lin, 2010).

In a randomized control study that was conducted more than two decades ago in a range of settings in the U.S. and included 252 ulcer, hypertension, diabetes, and breast cancer patients, physician-patient communication was assessed by both audiotaping as well as questionnaire administration to see if communication style would influence any clinical parameters or self-reported health status. A positive association was found between an effective physician-patient communication and blood pressure control, blood glucose level, and self-reported health status (Kaplan, Greenfield, & Ware Jr, 1989). Another study looked at the prevalence as well as the causes and implications for under-use of opioids medications among 191 veterans who received opioid medications for any pain. Under-users of opioids were identified using structured assessments that included detailed questions for the participants on how they use their opioid medications on a daily basis. Those who took less than the prescribed daily dose or reported having a pain that impaired their ability to function normally were considered under-users. Non-adherence

Table 2-1.   Model of treatment decision-making.

Analytical Stages		Paternalistic (Intermediate)	Shared (Intermediate)	Informed
Information Exchange	Flow	One way (largely)	Two way	One way (largely)
	Direction	Doctor → Patient	Doctor ↔ Patient	Doctor → Patient
	Type	Medical	Medical and Personal	
	Amount	Minimum legally required	All relevant for decision-making	All relevant for decision-making
Deliberation		Doctor alone or with other doctors	Doctor and patient (plus potential others)	Patient (plus potential others)
Deciding on treatment to implement		Doctors	Doctor and patient	Patient

Source: Reprinted from *Sociology as applied to medicine* (5th ed., p. 58), Scambler, G., & Myfanwy, M., Models of treatment decision-making in a doctor–patient dyad/ Table 4.3, 49-65, 2003, with permission from Elsevier.

to the prescribed opioids was not different from the non-adherence to any other medication regimens and was largely due to poor communication between patients and physicians (Lewis, Combs, & Trafton, 2010). The provision of patient-centered care was associated with improved medication adherence among patients with breast cancer (Lee & Lin, 2010). However, some studies have shown no association between patient experiences with care and health outcomes. In a large, multicenter, cross sectional study designed to investigate the relationship between clinical performance and patient experiences among adult patients (18-64 years) with continuous enrollment in one of five participating health plans in Massachusetts for at least a year, no association was found between patient experiences and clinical outcomes such as blood pressure, HbA1c, and LDL cholesterol level (Odigie & Marshall, 2008). In another cross sectional study conducted in the United Kingdom, the relationship between older patients' ($\geq$ 65 years) assessment of primary care and the control of hypertension as well as vaccination against influenza was investigated. No significant association between the older patients' assessment of primary care and the aforementioned quality of care measures was found (Rao, Clarke, Sanderson, & Hammersley, 2006). All in all, although some studies failed to show a significant association between patient-centered care and health outcomes, the preponderance of evidence supports a significant association between them (Doyle et al., 2013).

2.3   Assessing the Physician-Patient Relationship

The patient-physician relationship or encounter has been assessed using different methods including qualitatively by audiotaping or videotaping the physician-patient communication during patient visits. Recordings were analyzed using professional coders as well as several software systems to find repetitive themes than can be linked to certain communication styles (Hall, Roter, & Katz, 1988; Levinson et al., 1997). The physician-patient relationship has also been assessed by both audiotaping patient-physician encounter and then scoring the encounter using a patient-centered communication score tool (Oates, Weston, & Jordan, 2000). Today, a myriad of self-administered questionnaires have been developed and validated across multiple patient populations. These questionnaires report the fulfillment of patients' expectations, needs, and wishes based on past physician-patient encounters. The Patient-Doctor Relationship Questionnaire [PDRQ-9], Health Care Relationship [HCR] Trust Scale, and Consultation and Relational Empathy [CARE] measure are a few examples of questionnaires used in the primary healthcare field (Eveleigh et al., 2012). These instruments address different important attributes of the physician-patient relationship such as patient-centeredness, interpersonal communication, cultural sensitivity, and respectfulness. However, some instruments were found to be more comprehensive in addressing these attributes of primary care in comparison to other instruments. The Primary Care Assessment Survey (PCAS) and the Primary Care Assessment Tool (PCAT) are two validated instruments with good coverage of the primary health care attributes. Both are available in the public domain (Lévesque et al., 2012).

2.4 Health-Related Quality of Life (HRQoL)

In an era of patient-centered outcomes, patients' quality of life has become a more important outcome measure than proxy clinical parameters such as blood-pressure measurements, blood-glucose levels (Carr & Higginson, 2001). The provision of patient-centered care is expected to improve the quality of life by increasing patients' independence (Poochikian-Sarkissian, Sidani, Ferguson-Pare, & Doran, 2009). However, there is no consensus on the definition of patients' quality of life. It has been defined as "the extent to which hopes and ambitions are matched by experience"(Calman, 1984, p.124). Further, it has also been defined as the "individuals' perceptions of their position in life taken in the context of the culture and value systems where they live and in relation to their goals, expectations, standards, and concerns" (Orley, Kuyken, & de la Santé, 1994, p.290). However, some lean towards defining the patients' quality of life as the patients' assessment of their own functioning against what is considered as being ideal functioning level (Carr & Higginson, 2001; Cella & Tulsky, 1990).

Elderliness is a starkly different and variable experience for each patient. Some elderly patients view this stage of their life as a relaxing and enjoyable experience; however, others describe it as a bad experience (Xavier et al., 2003). In a study that investigated the important items influencing elderly patients perception of the quality of life, 141 elderly patients were randomly selected, and interviewed in person using an open-ended interview structure. The study concluded that patients' social relations, functional ability and activities are the three most important items that influence elderly patients' quality of life as much as their health status (Wilhelmson et al., 2005).

For several generations, the dominant theory in economics and social research that describes people's quality of life is utilitarianism. According to this theory, quality of life involves the satisfaction of individuals' desires and preferences (Cobb, 2000; Torrance & Drummond, 2005). There are many quality of life measurement questionnaires, but the most important fact to ponder is these instruments are only considered proxies or indirect indicators of quality of life. These instruments can never be treated as direct indicators of quality of life simply because people cannot observe their happiness or satisfaction directly. For example, people may report that they desire having something; however, when they have the means to get it, they get something else (Cobb, 2000). These instruments vary in their coverage of the quality life attributes (Torrance & Drummond, 2005). The EuroQol-5D, SF-36 & 12, and Nottingham health profile (NHP) are three commonly used and widely validated questionnaires across multiple medical conditions and have high reliability coefficient (Cronbach's Alpha >0.7) (Müller-Nordhorn, Roll, & Willich, 2004; Torrance & Drummond, 2005) **(Table 2-2)**.

2.4.1 EuroQol-5D (EQ-5D)

The EuroQol-5D is a generic instrument for describing and valuing health, which was developed by a consortium of investigators in Western Europe. It includes five attributes of quality of life: mobility, self-care, usual activity, pain discomfort, and

Table 2-2.   Comparison of quality of life instruments.

Domain	QoL Questionnaires		
	SF-36 & SF-12	**EuroQol (EQ-5D)**	**NHP**
Pain	Yes	Yes	Yes
Energy or tiredness	Yes	Not Covered	Yes
Sleep	Not Covered	Not Covered	Yes
Physical functioning or mobility	Yes	Yes	Yes
Daily living activities	Yes	Yes	Yes
Social interactions	Yes	Not Covered	Yes
Leisure activities	Yes	Yes	Not Covered
Work	Yes	Not Covered	Not Covered
Emotional wellbeing	Yes	Yes	Yes
Dependence or independence	Not Covered	Not Covered	Yes

Source: Coons, Rao, Keininger, & Hays, A Comparative Review of Generic Quality-of-Life instruments. Pharmacoeconomics 2000 Jan; 17(1): 13-35.

anxiety/depression. Each attribute has three levels: no problems, some problems, and extreme problems. This instrument is self-administered and respondents can rate their overall utility of life on a 0-100 hash-marked vertical visual analog scale (EQ-VAS). The EQ-5D has been widely used among the general population as well as patient samples and has been translated into more than 130 different languages (Herdman et al., 2011; Torrance & Drummond, 2005). However, there is evidence that the EQ-5D can suffer from a ceiling effect especially when it is used among a general population with minor medical conditions. Thus, there might be issues with its ability to detect small changes in health (Bharmal & Thomas III, 2006; Herdman et al., 2011; Huang et al., 2008).

2.4.2   Rand-36 (SF-36)

The Short Form Health Survey (SF-36) also known as, Rand-36 is one of the most widely used health related quality of life (HRQoL) survey instruments. It consists of 36 items that assess eight concepts in health: physical functioning, role limitations caused by physical health problems, role limitations caused by emotional problems, social functioning, emotional well-being, energy/fatigue, and general health perception. These concepts can be categorized into two component summaries (the Physical Component Summary [PCS-36] & the Mental Component Summary [MCS-36]). Twenty of 36 items assess the respondent's health in the past four weeks. The last item assesses the change in the perceived health in the last 12 months, and every item is scored on a scale from 0-100 (Hays & Morales, 2001). Owing to the length of time the SF-36 takes an individual to complete, a new and shorter version of the SF-36 was developed. The SF-12 is a succinct form of the SF-36 designed to assess the general self-reported health as well as the limitations in everyday activity owing to physical and mental health in the past four weeks and has the same two component summary scales (Ware Jr, Kosinski, & Keller, 1996). The SF-12 was shown to be more sensitive to subtle changes in health than the EQ-5D in a relatively healthy population (Johnson & Pickard, 2000).

2.4.3   Nottingham Health Profile (NHP)

The NHP was developed in the 1970s by a group of researchers in the Department of Community Health at Nottingham University. The instrument was designed to reflect lay people's perception of health as opposed to the medical professional assessment of patient health. It was created based on a pool of more than 2000 statements collected from in-person interviews that enabled the researchers to identify key concepts. Researchers reduced the number of statements to 38 for the first part and seven statements for the second part. Statements require a 'Yes' or 'No' response. The first part assesses perceived or subjective health, and statements fall into six domains: sleep, physical mobility, energy, pain, emotional reactions and social isolation. The first part is scored using weighted values, which results in scores ranging from 0 to 100 for each section. The higher the score on any section, the greater the severity of the perceived problems in that domain (Coons, Rao, Keininger, & Hays, 2000; Hunt, McEwen, & McKenna, 1985). The second part focuses on the domains of the daily life, which are

mostly affected by health: paid employment, jobs around the house, social life, personal relationships, sex life, hobbies and interests, and holidays (Hunt et al., 1985). The developers of the NHP have recommended that the second part should no longer be used (Bowling, 1991; Coons et al., 2000).

2.5   Medication Adherence

According to the World Health Organization, adherence is defined as "the extent to which a person's behavior (i.e., taking medications, following a diet, or making healthy lifestyle changes) corresponds with agreed upon recommendations from a healthcare provider" (Sabaté, 2003, p.136). However, medication adherence can also be defined as the degree to which patients' or their caregivers' medications administration behavior coincides with their physicians' advice with regard to timing, dosage, and frequency of administration during the prescribed time window (Osterberg & Blaschke, 2005). Adherence to prescribed medications is difficult for patients in general and particularly challenging for elderly. Multiple factors influence the elderly patients' adherence to their prescribed treatment regimens. Elderly patients' sociodemographic (age, race, sex, and education), medical (comorbidities, number of medications, and treatment of adverse events), psycho-behavioral (beliefs about medicine, understanding of the medical condition, and satisfaction with treatment), and economic (type of insurance, co-payments and coinsurance) characteristics are potential factors that can influence the elderly patients' adherence to their prescribed medications (Gellad, Grenard, & Marcum, 2011; MacLaughlin et al., 2005; Sa'ed et al., 2013) **(Figure 2-2)**.

The relationship between each of these factors and medication adherence is far from being simple and clear. For instance, older adults are often assumed to have lower adherence to their prescribed medications compared to younger adults. However, this is not always the case. Some studies have shown that advanced age ($\geq$65 years) is positively associated with adherence to prescribed drug regimens (Billups, Malone, & Carter, 2000). In addition, the number of medical conditions, the prescribed medications patients are receiving and their frequency of administration were positively associated with medication adherence (Billups et al., 2000; MacLaughlin et al., 2005). Furthermore, patient satisfaction with care may affect their adherence to medications (Dang, Westbrook, Black, Rodriguez-Barradas, & Giordano, 2013; Krousel-Wood, Muntner, Islam, Morisky, & Webber, 2009). Another important aspect of medication use, patients' satisfaction with their treatment regimens, was studied recently in a sample of patients with hypertension (HTN), and found to have a positive association with patients' adherence to their treatment regimens. Patients who were overall satisfied with their prescribed medications' effectiveness and convenience were more likely to be adherent to their treatment regimens (Sa'ed et al., 2013). In addition, health related quality of life (HRQoL) was also associated with medication adherence. Elderly patients with HTN and poor HRQoL scores have reported low adherence levels to their antihypertensive medications (Holt et al., 2010).
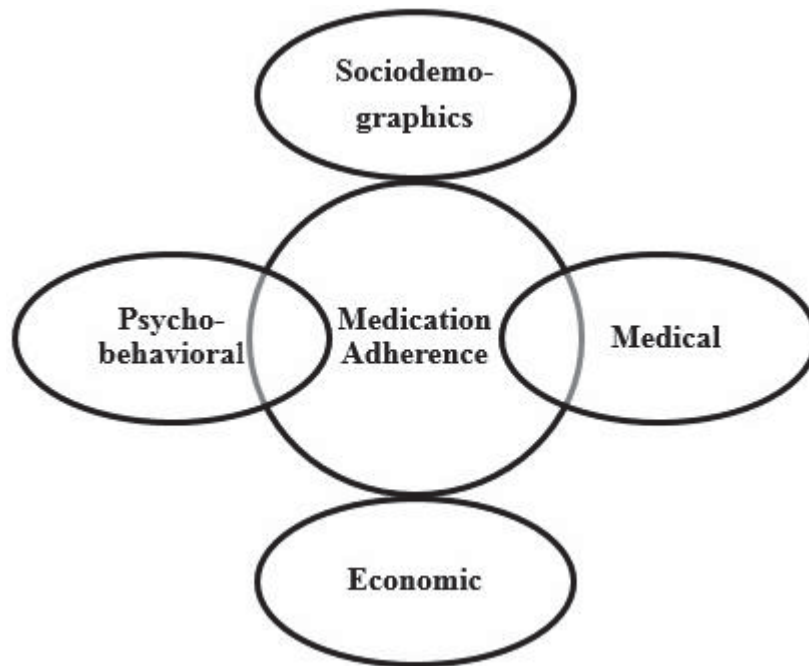
Figure 2-2.   Factors influencing medication adherence.

Source(s): Gellad, Grenard, & Marcum, A Systematic Review of Barriers to Medication adherence in the Elderly: Looking Beyond Cost and Regimen Complexity. *The American Journal of Geriatric Pharmacotherapy* 2011 Feb; 9(1): 11-23.
MacLaughlin et al, Assessing Medication Adherence in the Elderly: which Tools to Use in Clinical Practice? *Drugs Aging* 2005; 22(3):231-255.
Sa'ed, Al-Jabi, Sweileh, Morisky, Relationship of treatment satisfaction to medication adherence: findings from a cross-sectional survey among hypertensive patients in Palestine. *Health and Quality of life Outcomes* 2013 Nov; 11(1):191.

The importance of medication adherence stems from the fact that poor medication adherence has been linked to high healthcare costs in comparison to higher levels of adherence which were associated with lower healthcare costs. This is particularly true among patients with chronic medical conditions that can lead to untoward consequences if left uncontrolled (Pittman, Tao, Chen, & Stettin, 2010; Sokol, McGuigan, Verbrugge, & Epstein, 2005). HTN is one of the well-known preventable causes of cardiovascular disease morbidity and mortality. The utilization of antihypertensive medications has been found to reduce the risk of both coronary heart disease (CHD) and stroke by 34% and 21%, respectively (Mazzaglia et al., 2009). Patients with poor adherence to antihypertensive medications were at higher risk of all-cause mortality, stroke, and acute myocardial infarction (Esposti et al., 2011). Only 51% of the U.S. hypertensive population are considered adherent to their prescribed medications (WHO). Achieving an acceptable level of adherence (>80%) entails an open and honest relationship between patients and their physicians.

Medication adherence measures can fall into two different categories: direct and indirect measurements (Fairman & Matheral, 2000; Farmer, 1999). Direct measurement of medication adherence can be done through directly measuring the drug concentration in the patients' blood stream. It can also be done by observing patients and making sure that they swallow their pills and documenting that afterwards and by healthcare providers administering the medication to patients intravenously (IV), or intramuscularly (IM) and documenting the administration. Although direct measurement of adherence is considered the most reliable method of measuring adherence, this is impractical, uncommon, and rarely used. The indirect measurement of adherence are more commonly used and include medication monitoring (electronic monitoring, pills counts), self-report measures (diaries, surveys, and interviews), and prescription claims data (length of therapy, treatment gaps, medication possession ratio [MPR], and days of coverage) (Fairman & Matheral, 2000; MacLaughlin et al., 2005).

Although there are several methods for measuring medication adherence and each one of them has its own advantages and limitations, no one measure of the aforementioned methods is perfect (Fairman & Matheral, 2000). The advantage of self-report measures over other medication adherence methods is that they provide the reason for non-adherence from patients' perspective (Fairman & Matheral, 2000; Lavsa, Holzworth, & Ansani, 2010). Self-report measures and scales have differing attributes such as the administration time, reliability, specificity and sensitivity, validity, and their ability to detect barriers to medication adherence. The new and commonly used self-report medication adherence scale is the 8-item Morisky Medication Adherence Scale (MMAS-8). This scale was validated across a wide spectrum of clinical conditions with both high sensitivity (93%) and specificity (53%) towards detecting those with poor blood pressure control as well as high reliability (α=0.8) (Lavsa et al., 2010; Morisky, Ang, Krousel-Wood, & Ward, 2008). The original 4-items of the Morisky Medication Adherence Scale (MMAS-4) is a validated shorter version of the MMAS-8, but has lower internal consistency reliability (α=0.61), sensitivity (81%), and specificity (44%) in patients with HTN (Lavsa et al., 2010). Brief Medication Questionnaire (BMQ), Self-efficacy for Appropriate Medication Use Scale (SEAMS), and Medication Adherence

Rating Scale (MARS) are widely used questionnaires that assess medication adherence in multiple patient populations. The BMQ, SEAMS, and MARS have limited generalizability and lower reliability in comparison with MMAS-8 (Lavsa et al., 2010).

2.6   Beliefs about Medications

The healthcare delivery in the U.S. and other industrialized countries has been following the biomedical model for a long time. This model assumes that illness is linked to diseases that results in disturbances in the physiological functions of the body and are separate from the psychosocial factors that may affect the disease severity and treatment outcome (Annandale, 1998; Horne, 2000). However, in reality these factors are crucial in determining the success of any treatment plan, and without considering them it is highly unlikely that any disease management strategy would result in favorable outcomes (Ogden, 2012). Hence, it is important to assess and understand people's beliefs and attitudes towards disease and medicine.

The self-regulatory model has been proposed as one of the best health behavior models to explain the relationship between health beliefs and illness behavior (i.e., medication taking behavior). According to this theory, the individual reacts to illness both cognitively and emotionally **(Figure 2-3)** (Cameron & Leventhal, 2003). Understanding patients' beliefs and concerns about their newly diagnosed disease is important. However, equally important is patients' beliefs about the medications that treat these illnesses especially those medications that are used on a chronic basis (e.g., antihypertensives, antihyperlipidemics, and antiasthmatics). Some patients believe that taking medications to treat their medical conditions takes away their sense of control over their health. This eventually may affect their expectations of their prescribed medications which are also influenced by their past experiences (Dolovich et al., 2008).

Many of the published studies on health sociology focus on identifying barriers to healthcare access. However, fewer studies are investigating the patients' beliefs and concerns that may affect their compliance with physicians advice and recommendations (Horne, 2000). In an era of patient-centered care, patients are expected to take an active role with physicians in the decision making process (Lee & Lin, 2010). Thus, physicians need to understand patients' needs and concerns. This understanding can only be achieved through physicians' candid and frank conversations with patients. To help physicians understand these beliefs and concerns, several qualitative and quantitative studies have been conducted to identify repeated themes and measure the impact of the cultural background on patients' beliefs about medications in general (Britten, 1994; Horne et al., 2004; Lorish, Richards, & Brown, 1990) as well as about disease-specific medications (Emilsson et al., 2011; Farmer, Kinmonth, & Sutton, 2006; Lennerling & Forsberg, 2012; Paraskevi, 2012).
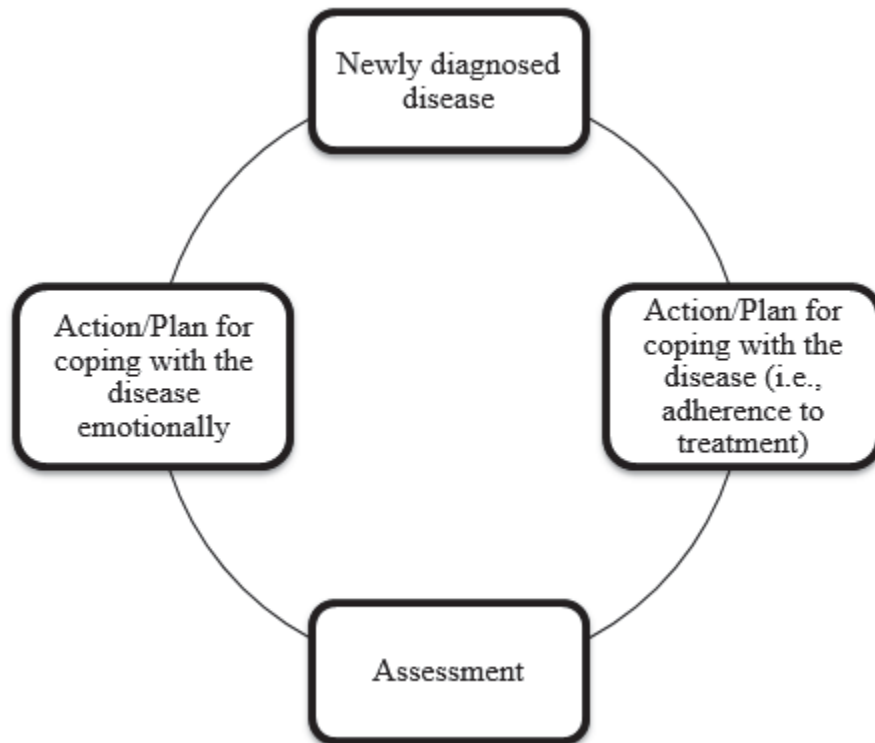
Figure 2-3.   Depiction of the self-regulation behavioral model.

Source: Cameron & Leventhal, Anxiety, Cognition, and Responses to Health Threats. The Self-regulation of Health and Illness Behavior. 2003 Jan; 157-183.

Patients' beliefs about medications are dynamically changing and are potentially formed based on their past experiences, healthcare delivery system, culture, beliefs (Dolovich et al., 2008; Phatak & Thomas, 2006). These beliefs are considered by some health sociologists as a hidden determinant of any treatment outcome (Horne, 1999). They can be classified under "central themes", such as people's perceptions about the inherent nature of the medications, the likelihood of the medications to do any harm or benefit, their tendency to cause addiction, and their likelihood to be overprescribed by physicians (Horne, 2000; Horne et al., 2004). The impact of these factors and other sociodemographic factors such as age on patient views and beliefs about medications are variable and controversial. For example, men were found in one study to have more negative beliefs about medications in general compared to women (Horne et al., 2004). In another study conducted in Sweden, women expressed negative views about medications and their harmful effects more than men (Isacson & Bingefors, 2002). With regard to age, older adults were more likely to have positive views about medications than their younger counterparts were, and those with lower incomes were more likely to think of medications as something necessary but evil at the same time than those with higher incomes were. Patients with HTN considered their antihypertensive medications as necessary, but evil more than patients with other medical conditions. Patients with a psychiatric diagnosis had more positive views about medications than any other patient populations (Isacson & Bingefors, 2002). Cultural background was also found to have a strong association with medication beliefs. For instance, patients of Asian descent have expressed negative views about medications more than those of European descent (Horne et al., 2004). Furthermore, in another study among Japanese patients, negative beliefs about medications were associated with non-adherence to medications (Iihara et al., 2004). Patients' educations were also associated with general beliefs about medications; those with lower levels of education were more likely to perceive medications as harmful compared to those with higher levels of education (Horne et al., 2004; Horne et al., 1999; Isacson & Bingefors, 2002).

Health status also influences patient beliefs about medications. Those with chronic medical conditions such as hypertension and diabetes have stronger feelings regarding the necessity of medications than those with acute medical conditions (Horne & Weinman, 1999). Patients who are currently on prescription medications have more positive beliefs about medications than those who are not (Ramstrom et al., 2006). Furthermore, believing in herbal/complementary medicine was associated with negative views about prescription medications in general. In addition, those who use herbal medicine have higher likelihood to think that physicians overprescribe (Horne et al., 2004; Isacson & Bingefors, 2002; Mårdby, Åkerlind, & Jörgensen, 2007). Another important and interesting factor that was found to influence patient beliefs about medications is the direct to consumer advertisement (DTCA) (Iosifescu, Halm, McGinn, Siu, & Federman, 2008). Finally, physicians' communication style was found to have a positive impact on patients' beliefs about medications which in turn resulted in better adherence to drug regimens (Bultman & Svarstad, 2000). Overall, patient beliefs about medications was shown to influence treatment outcomes in different patient populations. Patients who had negative views about medications were found to be less likely to adhere to their treatment regimens (Gatti et al., 2009; Iihara et al., 2004; Mårdby et al., 2007).

Patients' beliefs and concerns about medications were identified qualitatively in several studies (Britten, 1994;Conrad, 1985; Lorish et al., 1990). However, to measure medications beliefs quantitatively Horne, Weinman, and Haskins developed the Beliefs about Medicines Questionnaire (BMQ) based on extensive qualitative research that identified common themes in medication beliefs (Horne et al., 1999). The BMQ was tested for psychometric properties and has been found to be valid and reliable across multiple chronic medical conditions including but not limited to asthma, cancer, diabetes, and hypertension. The BMQ has two sections (Horne et al., 1999):

- The BMQ-Specific, which assesses patients' beliefs about medications, prescribed for a particular illness from two aspects. The first aspect is the necessity of use. The second aspect is concerns about the potential side effects that patients may experience upon the use of these medications.
- The BMQ-General, which assesses the personal views about the medications in general, and has two 4-items scales. The first scale is the general-overuse scale, which assesses whether patients feel that physicians put too much trust in medications and hence overprescribe them. The second scale is the general-harm scale, which assesses patients' beliefs about whether they regard medications in general as inherently harmful with limited usefulness.

2.7   The Value and Influence of Media Outlets on Patients' Health Beliefs and Behavior

2.7.1   Direct to Consumer Advertisement (DTCA)

Multiple media outlets (i.e., TV, Internet, newspapers) that advertise as well as educate the public about the signs and symptoms of different medical conditions and the medications that treat these conditions surround patients today. This phenomenon, called direct to consumer advertisement (DTCA), has grown rapidly in the last two decades. DTCA is currently the most noticeable type of health communication that the public encounters (Donohue, Cevasco, & Rosenthal, 2007; Rosenthal, Berndt, Donohue, Frank, & Epstein, 2002).

However, the public is split on DTCA between opponents who claim that it does nothing but harm, and proponents who believe that DTCA has many advantages that should not be overlooked. According to the proponents, DTCA informs as well as educates the public of certain medical conditions that they might have without them knowing about it. This eventually will encourage people to seek help and talk to their physicians if they think they have one of the symptoms listed in a medication's advertisement, which will in turn strengthen the patient-physician relationship by empowering patients to open up constructive dialogs with physicians. This would reduce the healthcare costs by people seeking help earlier before it is too late for medications to work. On the other hand, opponents of DTCA say that it misinforms patients. Opponents claim that most pharmaceutical companies advocate for the use of their medications by

devoting most of their commercial advertisement time to the benefits of taking their medications and spend far less time on the possible adverse effects. By doing so, pharmaceutical companies overemphasize the benefits of their medications and underestimate the potential risks associated with their use. Another issue that critics have is the hastiness of the pharmaceutical companies to release their commercial advertisements of their new medications in the media without giving the post-marketing surveillance an adequate amount of time to check the safety of the medication on a larger scale, such as with (Vioxx®, Merck) incident. Opponents also believe that DTCA poses a real threat to (a) public health through inappropriate prescribing by some physicians who feel pushed sometimes by patients to prescribe a certain medication for them although they do not need it, and (b) the economy by exacerbating the rate of rising healthcare costs (Ventola, 2011).

Minorities and Internet savvy people are more likely to be in favor of DTCA, while people with higher level of education are more likely to oppose DTCA. Overall, DTCA is more appealing to many individuals with less power and control given the fact that it directly reaches the public without being channeled through the healthcare system (Ceccoli & Klotz, 2013).

2.7.2   Online Search for Health Information

When it comes to the information sought by patients online and not directly presented to them through DTCA, fewer studies have investigated the impact on patient health behavior. The development of online health education websites is rapid with the potential to influence the way patients interact with their physicians (Sciamanna, Clark, Diaz, & Newton, 2003). It has been claimed that 80% of the U.S. adults and 60% of their European counterparts use the Internet to seek medical advice (Sillence, Briggs, Harris, & Fishwick, 2007). Internet use for health-related activities assessed by the 2002 Pew Internet and American Life Project found that 6 out of 10 Americans have access to the Internet (Sciamanna et al., 2003).

Unlike the DTCAs that are usually presented to the public in a simple language format (i.e., story structure), several issues face consumers and patients alike when they search online for information about a medication or a medical device. Patient health literacy, the complexity of information or medical jargon, the variability of the content quality, and the potential for commercial interests to influence the content of the online information are some examples of issues that face patients when they use the Internet to look for information about a medical condition or a medication (Winker et al., 2000). In a systematic meta-analysis of health-related websites evaluations, 70% of studies reported that the quality of websites was an issue (Sillence et al., 2007). Despite these issues, many patients turn to the Internet to seek information about health and treatment as well as support. According to the National Cancer Institute's Health Information National Trends Survey, 56.5% of the breast cancer patients visited an online website to learn more about their clinical condition. They also have reported that the Internet represents their second source of information after their physicians. Online information was also

found to have a positive effect on the physician-patient relationship (Shaw et al., 2007). In another cross-sectional study, patients who do not have Internet access and felt that their physicians engaged them in the decision making process were more interested in using the Internet for health-related activities compared to those who felt that their physicians engaged them less in the decision making process. On the other hand, no association was found between having interest to use the Internet for health-related activities and physician-patient relationship among those who have access to the Internet. This suggests that once people have access to the Internet they no longer view it as filling in gaps in their communication with physicians, but as a secondary source of information after their physicians' advice (Sciamanna et al., 2003). In another national survey, the access to reliable online health-related websites has been linked to reduced anxiety, a feeling of self-efficacy, and reduced utilization of ambulatory healthcare services (Ybarra & Suman, 2006). Evidence also suggests that online health information may in fact encourage individuals to seek healthcare (Ybarra & Suman, 2006).

Research has shown that most online health information seekers use a general search engine (i.e., Yahoo®, Google®) rather than MedlinePlus (Health Information from the National Library of Medicine). They typically spend about half an hour browsing two to five websites and afterwards do not remember the website's name from which they obtained the information. They usually seek information online to enhance their knowledge of their medical conditions, help them diagnose a medical condition, and sometimes verify their physician's diagnosis and medical advice (Ybarra & Suman, 2006). Minorities have greater interest in using the Internet to seek health information as well as to check the appropriateness of their medical treatment because they feel the Internet is relatively race neutral (Sciamanna et al., 2003). Adults who are ≥ 65 years of age have been found to be the least users of the Internet (Jenkins & Dunn, 2004). Whereas middle-aged adults were more likely to use the Internet for health-related information, and 41% of the adolescents have reported changing their health behavior as result of visiting health educating websites (Ybarra & Suman, 2006).

In a qualitative study that aimed to test how patients trust online health-related information, 15 white postmenopausal women with at least high school degree were enrolled in a longitudinal study that was conducted between August 2003 and April 2004 in the United Kingdom. All were keen to learn more about this critical period of their life, and have reported visiting women's health websites at least once a week. The theoretical staged model of trust that was proposed for the study was divided into three phases **(Figure 2-4)**. In the first phase, each participant attended a two-hour session in an Internet café for four weeks. During each session, the participants were given an hour to search the Internet for information related to women's health, followed by a 50-minute discussion with a facilitator. In the discussion session, participants were asked about their current online information sources, their search strategies, trusted and mistrusted websites, their first impressions, and the revisited websites. In the next phase, the participants were asked to log their online health search behavior in diaries over the
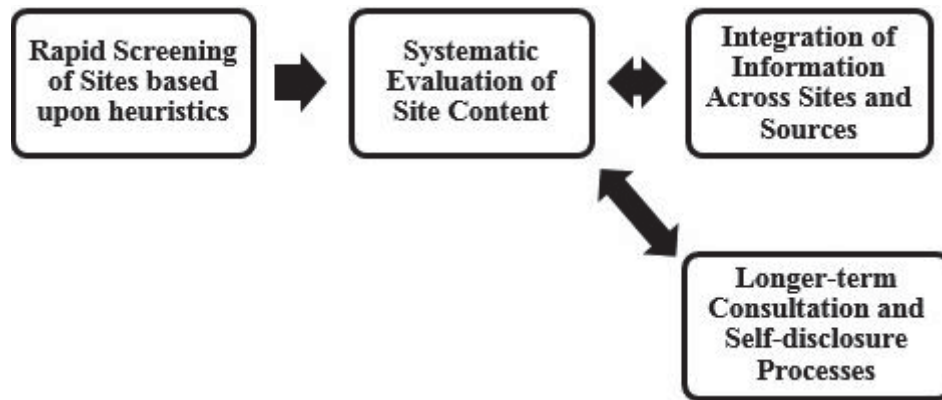
Figure 2-4.   Staged model of trust.

Source: Reprinted from Social Science and Medicine, 64(9), Sillence, Briggs, Harris & Fishwick, How do Patients Evaluate and Make Use of Online Health Information?/Figure 1, 1853-1862, 2007 Feb, with permission from Elsevier.

following 6 months. In the final phase, that followed the second phase by one month, the participants underwent a structured telephone interview to assess the influence of the online sources on participants' relationships with their physicians as well as their level of involvement in the decision-making process. All discussions were recorded and transcribed, and then extracts of trust and mistrust were coded. Diaries were analyzed based on the thematic analysis, and the interviews according to the emergent themes. The participants reported that the design and feel of the website was one of the deciding factors on whether they accept or reject a website (i.e., websites with pop-up advertisements were more likely to be rejected). Furthermore, websites that belong to credible organizations (i.e., reputable healthcare institutions), and reviewed by experts were more likely be accepted. The participants also reported that websites that address most of their questions, have relevant answers, and have information written by laypeople were likely to be revisited. The online search for health-related information increased the participants' feelings of social support, and provided them with an opportunity to explore alternative treatment options. In addition, the online information was found to influence the patients' preference for health decision-making without having any negative effect on their relationship with their physicians (Sillence et al., 2007). In another study, factors such as convenience and anonymity of getting information through online health websites were found to be crucial for consumers who browse such websites. In addition, the readability of the information presented on the health websites is highly important given the fact that the average American reads at 8th grade level and 20% of the Americans read at 5th grade level (Jenkins & Dunn, 2004).

Visiting online health-related websites had a positive impact on the patient adherence to treatment (Kuppersmith, 2002). It also had several potential benefits with regard to the physician-patient relationship by helping patients to make informed healthcare decisions, empowering them to collaborate with their physicians, getting them involved in the decision-making process, using the time with physicians more efficiently, helping them find online support groups, and hearing about other patient experiences with the same medical condition or on similar treatment (Wald, Dube, & Anthony, 2007). However, patient access to online health-related websites can also have potential disadvantages. In a study that investigated the role of the Internet on the physician-patient relationship, 90% of the people who visit health-related websites frequently felt that they could manage their own health issues by themselves, and 82% of them stated that the websites provided more useful information on new medications and alternative treatment options than their physicians or pharmacists. The lack of attention to details, the personal touch that once existed in the physician-patient relationship, and the limited period of time patients see physicians were cited as the main reasons behind the findings (Erdem & Harrison-Walker, 2006). Access to the websites by patients may also diminish their trust in their physicians as well as in the healthcare system creating a real challenge to physicians to regain their patients' trust back again (Wald et al., 2007). Also, patients trust in the websites may lead to self-diagnosis, treatment using over-the-counter medications, result in misdiagnosis, and inappropriate treatment if incorrect information was relied on (Erdem & Harrison-Walker, 2006). Furthermore, health-educating websites may exacerbate socioeconomic health disparities due to the fact that some patients do not have access to the Internet (Wald et al., 2007).

The rapid expansion of online medical information, easier access to online health information by patients, and heightened consumer expectations has changed the role of the physician drastically. Physicians today must help patients interpret information they have gathered, guide them to reliable sources of information, and develop a strategy for finding and integrating new information. (Kuppersmith, 2002). Today, patients can go online and search for good physicians (i.e., reading people's reviews and stars ratings) by browsing multiple physicians' rating websites. However, the Internet does not only have physician evaluation websites, it also has several medication and medical device rating websites. These websites reflect other patient experiences with medications, treatment approaches, and medical conditions in general. Assessing and understanding the value of these websites to patients is important.

CHAPTER 3.   METHODOLOGY

3.1   Study Design

The primary purpose of the research study was to explore the value of online ratings of medications to the elderly population and evaluate if older adults' views regarding such online websites providing patient feed-backs of their medications varies with their sociodemographics, quality of life, beliefs about medication, health literacy, preferences for involvement in decision making, and medication adherence. The study main goal was to explore the relevance of such online websites to older adults' care (i.e., facilitating physician-patient communication, and encouraging patients to take part in the decision-making). Further, participants' views of such online websites (i.e., do they trust the online ratings of medications) were also considered. Relevant information thought to impact older adults' opinions of such websites including their sociodemographics, health literacy, medication adherence, preference for involvement in health decision-making, beliefs about medications, and quality of life were collected using validated questionnaires. Seven senior centers in the State of Tennessee were visited and older adults (≥60 years of age) were asked to complete Patient Reviews of Medication Experiences questionnaire that examines the value of online ratings of medication websites. Alongside PROMEX, participants were also asked to complete other validated questionnaires that collected information about factors that may affect the elderly participants' opinions of such online websites. Permissions to use these questionnaires were received prior to the beginning of the study **(Appendix A).**

3.2   Settings and Subjects

Data were collected in Tennessee at senior centers in Memphis and the surrounding areas of Arlington, Bartlett, Cordova, and Somerville. Older adults visit these senior centers to socialize with their peers and spend fun time together. Seniors who met the following criteria (1) being 60 years of age and older and (2) taking prescription medications were asked to participate in the study. Further, those who reported having HTN were asked to complete a second part of the PROMEX questionnaire that assessed the level of adherence to their antihypertensive medications.

3.3   Sampling Plan

A convenience sample of 300 elderly subjects from the senior centers were recruited. Both the principal and co-investigator chose this method due to time and resource limitations. However, we tried to make our sample as representative as possible by recruiting participants from different locations.

3.4   Data Collection

The Senior Centers' coordinators were contacted at least a week prior to the planned visit and a date and time was set up. Two research assistants visited the following senior centers:, the Orange Mound Senior Center, McWherter Senior Center in Memphis, Frayser-Raleigh Senior Center and Bert Ferguson Community Center in Cordova located in Memphis; the Bartlett Senior Center in Bartlett, the Somerville Senior Center in Somerville, and the Senior Citizens Center in Arlington. In reserved private rooms in these Senior Centers, the survey administrators explained to the seniors that their participation was voluntary and they could withdraw from the study at any time without penalty. Further, the first page of the survey explained the purpose of the study, the rights of the participants and asked participants to sign a consent form before starting the survey.

The survey consists of two parts: all older adults on prescription medications regardless of their medical conditions should complete the first part; however, the second part was completed only participants with HTN should since it includes a medication adherence questionnaire that measures adherence among those participants. Those who completed the survey received a $20 Kroger gift card as an appreciation for their participation. Data collection was started in August 2013 and was completed in December 2013.

3.5   Participant-Reported Outcome Measures

3.5.1   Older Adults' Opinions of the Online Medication Rating Websites

A validated measure that surveys individuals about the usefulness of online reviews of medications by patients did not exist. Therefore, a questionnaire was created to address important aspects of the online medications rating websites that are important to the older adults. The Patient Reviews of Medication Experience (PROMEX) questionnaire has two domains:

    I.   The value of such websites in general as well as in facilitating patient-physician communication.
   II.   The trustworthiness and the influence of online patients reviews of medications on the participant's medication preference.

The first proposed domain consists of four questions with a five-point Likert scale, in which the first question inquires about the usefulness of such websites in general from the perspective of older adults. Further, to explore the usefulness of the online patients' medications reviews, the participants were asked about the likelihood they would mention it to their physicians/prescribers. The third question inquired about the likelihood such online reviews would facilitate communication with their physicians. The final question inquired about the probability that physicians would be upset if the participants brought up the online reviews.

The second proposed domain contains three questions with a Likert scale of five points. The first question in this domain inquired about the trustworthiness of such websites to participants. To examine how much older adults trust such websites that show them medications reviews, we asked them about the likelihood they would provide their own comments and ratings of their prescribed medications. The final question inquired about the influence of the online patient reviews of medications on the participants' medication preference. The total number of questions in both domains is seven with proposed maximum points of 35 and a minimum of seven. The higher the score, the more likely older adults believe that these online websites are useful in general as well as in facilitating their communication with physicians.

Since the PROMEX questionnaire was newly created and recently used, it was validated using Principal Component Analysis and Varimax Rotation methods to test for its construct validity. To test for reliability, the internal consistency (Cronbach's Alpha) method was used.

3.5.2   Patient-Centered Practice Attributes

The Primary Care Assessment Survey (PCAS) is a validated 51-item, self-report questionnaire which is designed to operationalize the formal definitions of primary care. The PCAS measures seven domains of primary care through 11 validated summary Likert-scaled measures which perform consistently well across population subgroups defined based on age, sex, education, race, household income, and health status. Each scale ranges from 0 to 100 with higher scores indicating more of the underlying attribute (Safran et al., 1998).

The Communication and the Interpersonal Treatment are two validated scales within the Primary Care Assessment Survey (PCAS) (Safran et al., 1998). Both the Communication and the Interpersonal Treatment summary scales have excellent reliability with high Cronbach's Alpha (0.95) (Nunnally, 2010; Safran et al., 1998). In the communication scale of the PCAS, participants were asked to rate their physicians on six important aspects of primary care that are aligned with the Institute of Medicine (IOM) definition of primary care. These aspects are: the thoroughness of the questions being asked about their symptoms, attention to what they have to say, explanations provided about their medical conditions and treatment, instructions about symptoms to report and when to seek help, advice and help in making decisions about their own care, and finally whether they leave their Physicians' offices with unanswered questions (Care, Donaldson, Yordy, & Vanselow, 1994; Safran et al., 1998). The interpersonal treatment scale addresses another five aspects of primary care that are also aligned with the IOM definition of primary care; participants were asked to rate their physicians on the amount of time spent with them, patience with their questions, friendliness and warmth received, care and concern, and finally the level of showed respect to them (Safran et al., 1998).

Each of the covered items in both the communication and the interpersonal treatment scales have six possible answers based on the Likert scale. Each one of them is assigned a

value (i.e., Very poor=1, Poor=2, Fair=3, Good=4, Very good=5, Excellent=6; or Always=1, Almost always=2, A lot of the time=3, Some of the time=4, Almost never=5, Never=6). The Communication scale has six questions with six possible answers for each question. The highest possible score of 36, the lowest possible score is six, and the possible raw score range is 30. The interpersonal treatment scale has five questions with six possible answers. The highest possible score is 30, the lowest possible score is 5, and the possible raw score range is 25. The higher the scores of both the PCAS-Communication and PCAS-interpersonal treatment scales, the higher the satisfaction of the respondents of both their physicians' communication and interpersonal treatment.

3.5.3   Health-Related Quality of Life

Participants' Health-Related Quality of Life (HRQoL) was measured using the Short Form Health Survey (SF-12v2). The SF-12v2 is a validated generic questionnaire (Cronbach's Alpha>0.7), which assesses the general self-reported health as well as limitations in everyday activity owing to physical and mental health in the past four weeks(Ware Jr et al., 1996). It has two component summary scales, the Physical Component Summary (PCS-12) and the Mental Component Summary (MCS-12) with higher scores (ranges between 0 to 100) indicating better quality of life (Ware Jr et al., 1996).

3.5.4   Patients' Beliefs about Medications

The patients' beliefs about medications were assessed using the Beliefs about Medicine Questionnaire (BMQ). The BMQ was developed by Horne in the United Kingdom and has been validated across multiple health conditions (Horne et al., 1999). It consists of two sections, one general and one specific. The general section contains eight statements that can be broken down into two themes. The first theme is the "General-Harm", which comprised beliefs about the intrinsic nature of medications and the extent to which they are perceived as harmful. The second theme is the "General-Overuse", which is comprised of beliefs about the way medications are used and in particular, whether physicians overprescribe them. The second section consists of ten statements that can be broken down into two themes. The first theme is the "necessity", which focuses on the perceived necessity of the medication to maintain and improve the health. The second theme is the "concerns", which focuses on the perceived concerns of the potential adverse effects of the medications. Respondents can indicate their level of agreement with each statement on a five-point Likert scale (Horne et al., 1999). Since seniors who were taking prescribed medications were surveyed about their opinions of the online reviews of medications, and were not focusing on a certain disease, the general BMQ was used.

3.5.5 Medication Adherence

Medication adherence was measured using Morisky Medication Adherence Scale (MMAS-8) among those who reported having hypertension. The MMAS-8 is a validated self-report questionnaire that consists of eight questions. An alpha reliability of 0.83 was computed among 1367 patients who were diagnosed with essential HTN by primary care providers in an outpatient clinic of a large teaching hospital and was significantly associated with blood pressure control ($p<0.05$). The underpinning theory of this questionnaire was that failure to adhere to treatment regimen could stem from several factors such as forgetfulness and complexity of the treatment regimen. The MMAS-8 questions were phrased in a way to avoid the "yes-saying" bias, which is usually the patients' tendency to give positive answers to healthcare providers. The questions address patient medication taking behavior but not medication adherence determinants; with a dichotomous response (yes/no) to 7 out of 8 questions and 5-point Likert response for the last question. The total scale has a range between zero and eight with higher scores indicating better adherence. A cutpoint of <6 is used to identify patients with poor adherence to an antihypertensive treatment regimen with 93% sensitivity and 53% specificity. Each question was given a score of either zero or one. If the participant answered questions 1, 2, 3, 4, 6, and 7 with "Yes", a score of zero was assigned to each response; and if their answers was "No" a score of one will be assigned to their responses. However, in question five, if participants answered the question with "Yes", a score of one was assigned to their response, and zero if their answer was "No". In question eight which has 5-point Likert response scale, a score of one was assigned to participants' response if they chose "Never", 0.75 if "Once in a while", 0.5 if "Sometimes", 0.25 if "Usually", and 0 if "All the time" was selected. The predictive validity of this scale has been assessed through association with blood pressure readings, attitude, social support, coping techniques with stress, knowledge about their medical condition and treatment, and patients' satisfaction with the provided care (Krousel-Wood et al., 2009; Morisky, Ang, Krousel-Wood, & Ward, 2008; Morisky & DiMatteo, 2011).

3.5.6 Older Adults' Evaluation of Their Antihypertensive Medication Regimens

To further understand the value of PROMEX and examine the association between participants' evaluations of their own medications and medication adherence as well as other participant-reported outcomes (PROs) such as the quality of life, a simulation of PROMEX was created at the end of survey. We asked the participants who reported taking medications for HTN to rate their medications on a scale from 1 to 5 on five different medication use aspects (i.e., effectiveness, side effects, ease of use, cost, and food interactions) and give an overall rating for each medication. Four medication-rating tables were provided in case the participant was taking more than one medication for HTN. A specific score was created for each participant by taking the average of each participant's antihypertensive medication regimen ratings for every single medication use aspect as well as the overall rating. Both the overall rating score of the participants' antihypertensive medication regimens as well as the specific medication use aspects rating scores were reported.

3.6   Participants' Characteristics

3.6.1   Sociodemographics

Participants were asked to report their age, gender, race, and years of education, marital status, and the household member(s) they live with via either filling in the blanks or checking off the answer that best describes their situation. The participants' age was categorized into four groups (i.e., 50-60, 61-70, 71-80, and >80 years of age). Further, the participants' mean age ± standard deviation was compared across senior centers. Race was categorized into four groups (i.e., African Americans, Caucasians, Hispanics, and Others). Marital status was dichotomized into two groups (i.e., married vs. unmarried)[1] . Education was categorized into three groups based on the number of years spent in school or higher education (i.e., high school or less, college degree, post-graduate degree). Living status was dichotomized into two groups (i.e., alone vs. not alone)[2].

3.6.2   Health Decision Sharing Preference

Patients' engagement in their own health care has been associated with both lower health costs and hospital admissions (Hibbard & Greene, 2013). Research shows patients in general want to be involved in their health care (Bernabeo & Holmboe, 2013). However, understanding the factors that influence patients' decision sharing preference is still elusive (Légaré & Witteman, 2013). Therefore, many like to describe the patients' preference for involvement in the health care decision making as patient-specific (Bernabeo & Holmboe, 2013). Thus, a validated question was included that assessed the participant's preference for engagement in their health care (Lawler, 1998). Participants were asked the following question (Lawler, 1998, p.1549; Ray, 1997):

"What do you prefer for involvement in decisions about your health care? Would you prefer to:

- Keep control in your own hands?
- Have an equal partnership with the doctor?
- Leave it in the doctor's hands?"

The health care decision sharing preferences across the different senior centers were compared. However, to know whether the health decision sharing preference had any impact on participants' views of PROMEX, they were categorized into two groups. Even though response options I and III were distinctly different, they share one thing, a health decision non-sharing preference. Therefore, they were labeled as a healthcare decision

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[1] Unmarried includes all those who reported being widowed, divorced, separated, and single.
[2] Not alone includes all participants who reported living with a spouse, friend, community center, family members…etc.

non-sharing group. The second group includes those who preferred to have an equal partnership with their physicians.

3.6.3 Health Literacy

Health literacy is variable among different patient populations and has a significant impact on several health outcomes such as medication adherence (Kripalani, Gatti, & Jacobson, 2010; Kutner, Greenberg, & Baer, 2005). Therefore, controlling for this important variable is crucial in understanding the relationship between any two participant-reported outcome measures. There are several validated questionnaires that have been widely used to assess patients' health literacy level such as the Test of Functional Health Literacy in Adults (TOFHLA) (Parker, Baker, & Williams, 1995). However, due to the length of the questionnaires, new and shorter versions of the same health literacy assessment tools have been developed (Baker, Williams, Parker, Gazmararian, & Nurss, 1999). Further, health literacy screening questions with high Area under the Receiver Operating Characteristic (AUROC) have been created and validated to assess patients' health literacy with only one question (Wallace, Rogers, Roskos, Holiday, & Weiss, 2006). Thus, the following question was used "How confident are you filling out medical forms by yourself?" (Extremely, quite a bit, somewhat, a little bit, or not at all) with an AUROC of 0.79 (95% CI=0.74 to 0.83) when plotted against the Rapid Estimate of Adult Literacy in Medicine (REALM). The "somewhat" response was recommended as the optimal cutoff point to identify participants with limited or marginal health literacy skills (Chew, Bradley, & Boyko, 2004; Wallace et al., 2006, p.874). Thus, the respondents were dichotomized into two groups: marginal/limited and good health literacy.

3.6.4 Medical Conditions

Senior participants were asked to identify diseases they had from a list of more than 14 medical conditions prevalent among the U.S. population in general and among the U.S. elderly population in particular (Ward, 2013). The list included the following:

1. Hypertension.
2. Angina pectoris or coronary artery disease (CAD).
3. Congestive Heart Failure (CHF).
4. Myocardial infarction or heart attack.
5. Stroke.
6. Asthma, emphysema or COPD (Chronic Obstructive Pulmonary Disease).
7. Diabetes.
8. Arthritis or any kind of rheumatism.
9. Chronic back pain or sciatica.
10. Depression.
11. Gastroesophageal Reflux Disease (i.e. chronic heartburn "GERD) or ulcers.

12. Cancer (other than skin cancer).
13. Sexual dysfunction.
14. Irritable bowel syndrome or indigestion.

Further, the participants were asked to write down the number of prescription medications that they were currently taking. In addition, those who had HTN were asked to write down the number of years since they were diagnosed with HTN as well as the number of medications they were taking.

3.7   Statistical Analysis

3.7.1   Sample Size Estimation

The estimated minimum sample size for a medium effect size at a power=0.80 and α=0.05 for multiple regression analysis and for eight independent variables based on the Cohen statistical power analysis method is 107 participants (Cohen, 1992). In addition to the Cohen statistical power analysis method, the GPOWER software was also used to estimate the minimum sample size using the same criteria and determined 127 participants were needed for twelve explanatory (i.e., independent) variables (Erdfelder, Faul, & Buchner, 1996). In this research project, 300 seniors have participated and completed the survey.

3.7.2   Descriptive Statistics

Frequencies and means were reported for sociodemographic and medical history variables. Means and standard deviations were reported for continuous variables. For ordinal and nominal variables, percentages were reported. The comparisons between the groups were made with the use of a two-sided student's t-test for continuous data and chi-square test for categorical data. Further, one-way analysis of variance (ANOVA) was used to test the difference in the means between the different categorical variables (Tabachnick & Fidell, 2001).

3.7.3   Assessing PROMEX Reliability

The reliability of PROMEX was computed using the Cronbach's alpha (Seibert et al., 1999). Cronbach's alpha is a measure of internal consistency that is commonly used in questionnaires' reliability validation (Thorndike & Hagen, 1961). A questionnaire with Cronbach's alpha of ≥0.7 is considered to be internally consistent (Cronbach, 1951).

3.7.4 Principal Component Analysis

Principal Component Analysis was used to identify the underlying factor structure of the Patient Reviews of Medication Experiences (PROMEX) questionnaire. Although two factors or domains have been hypothesized to be the underlying construct of PROMEX, the Principal Component Analysis was conducted to verify the hypothesis (Suhr, 2005). An eigenvalue greater than or equal to one along with the results of the scree plot were used to determine the number of possible factors or domains that can be extracted from PROMEX. Further, varimax rotation was also used to determine the loading of each variable on each potential factor (Jolliffe, 2005).

3.7.5 Path Analysis

Wanting to examine the association between different participant-reported outcomes such as quality of life and medication adherence with the participants' views of PROMEX, the running of simple linear regression models where potentially more than one dependent variable can exist was not possible. Therefore, using path analyses in which multiple dependent variables can coexist is more plausible. As an extension of multiple regression (Streiner, 2005). Path models have several advantages over multiple regression. Firstly, it is a powerful technique in which complex models with multiple dependent variables as well as chains of influence can coexist may be more plausible in certain research settings like ours (Streiner, 2005). Secondly, the path analysis approach is more flexible than the ordinary least square method as the structure of the path models can be modified to increase the model's fitness (Nazim & Ahmad, 2014). Thirdly, it enables one to disentangle complex interrelationships among variables and eventually identify the most significant pathway in predicting the outcome (i.e., dependent) variable (Lleras, 2005).

3.7.5.1 *The Association between the Older Adults' Views of the Online Reviews of Medications and Their Satisfaction with Physician Communication*

In order to determine whether the association between participant satisfactions with their physicians' communication and their views of the online rating of medications, a path model based on the evidence based predictors of patients' satisfaction with physicians' quality of care was created. The model created represented the evidence based sociodemographic and health status predictors of the satisfaction with physicians' communication. Age, education, marital status, health literacy, comorbidities, race, and gender are significant predictors of patients satisfactions with physicians (Hall & Dornan, 1990; LaVeist & Nuru-Jeter, 2002; Moy & Bartman, 1995; Tucker & Kelley, 2000). Then, the association of the Primary Care Assessment Survey (PCAS) the Communication scale and the participant's views of the online rating of medications (PROMEX) was looked at.

3.7.5.2 The Association between the Older Adults' Views of the Online Reviews of Medications and Their Quality of Life

Any path model that tests the Health related Quality of Life (HRQoL) effect on any outcome variable, should take into consideration the significant predictors of HRQoL. Therefore, a path model was tested taking into account the sociodemographic factors, health status, and interpersonal treatment as well as effective healthcare communication with participants that were significant predictors of HRQoL (Felce, 1997; Low & Molzahn, 2007; Odigie & Marshall, 2008; Xavier et al., 2003).

3.7.5.3 The Association between the Older Adults' Views of the Online Reviews of Medications and Their Beliefs about Medications

In order to examine the influence of participants' beliefs about medications on their views of the online reviews of medications, the evidence-based predictors of participants' beliefs about medications must be accounted for in a path model. Then, the effect of beliefs about medications on participants' views of online rating of medications can be examined in the same model. Physicians' communication style, participants' age, culture or ethnicity, education, gender, and the number of prescription medications the participants take on a daily basis are considered significant predictors of participants' beliefs of medications (Bultman & Svarstad, 2000; Horne et al., 2004; Iihara et al., 2004; Isacson & Bingefors, 2002; Mårdby et al., 2007).

3.7.5.4 The Association between the Older Adults' Views of the Online Reviews of Medications and Their Adherence to Antihypertensive Medications

In order to examine the effect of medication adherence on the participants' views of online medication reviews (PROMEX), a path model was constructed based on evidence-based predictors of medication adherence. Age, gender, race, beliefs about medications, health literacy, satisfaction with physicians' communication, education, the number of prescription medications, comorbidities, and overall rating of antihypertensive treatment regimen were included in the model (Gellad et al., 2011; Krousel-Wood et al., 2009; Morisky et al., 2008; Sa'ed et al., 2013).

3.7.5.5 The Association between the Older Adults' Views of the Online Reviews of Medications and Their Satisfaction with Physicians' Communication, Beliefs about medications, and Health-Related Quality of Life

The association between participants' views of online medication rating websites (PROMEX) and their satisfaction with physicians' communication, beliefs about medications, and health-related quality of life was examined in one model in which most of the evidence-based predictors for each of the included participant-reported outcomes were controlled for in this overarching model.

In this model, race, gender, marital status, and health literacy were specified as direct predictors of the participants' satisfaction with their physicians' communication, which was measured by the PCAS-Communication scale (Hall & Dornan, 1990; LaVeist & Nuru-Jeter, 2002; Moy & Bartman, 1995; Tucker & Kelley, 2000). With regard to participants' beliefs about medications, which was measured by the BMQ-general, the number of prescription medications participants reported taking, participants' satisfaction with their physicians' communication, gender, and race were specified as direct predictors participants' beliefs about prescription medications (Horne et al., 2004). Further, the participants' health-related quality of life scores measured by the PCS-12 and MCS-12 of the SF-12v2 were included in the model with the number of chronic health conditions, age, number of prescription medications, health literacy, marital status, and education specified as direct predictors of these two health-related quality of life scales (Felce, 1997; Low & Molzahn, 2007; Odigie & Marshall, 2008; Xavier et al., 2003). Moreover, even though some variables, which were collected in the study, and may predict certain participant-reported outcomes, such as health literacy and BMQ-general, were not specified as direct predictors of these outcomes, these variables were controlled for indirectly since all of the sociodemographic and medical factors that were collected from the participants in this study were included in this model.

Finally, the PCS-12, MCS-12, and the health decision sharing preference were specified as direct predictors of the participants' views of online medication rating websites, which was measured by PROMEX. These three variables were specified as direct predictors of PROMEX for several reasons. The health-related quality of life is a multidimensional concept that is influenced by an array of factors. Therefore, the specified predictors of both the PCS-12 and MCS-12 in the model captured most of the variables, and hence the impact of other variables on PROMEX can be indirectly examined. In addition, the health decision sharing preference was specified as a direct predictor of PROMEX since it is participant-specific (Bernabeo & Holmboe, 2013).

3.7.6   Regression Analysis

In addition to the path analysis, multiple linear regression analysis was conducted to assess the relationship between the perceived value of the online patients' reviews of medications by older adults and each of the aforementioned participant-reported outcomes. The dependent variable of interest was the total score of PROMEX. The independent variables of interest were the scores of the communication domain of the PCAS, Mental and Physical Component Summaries (MCS & PCS) of the SF-12v2, Beliefs about Medicines Questionnaire (BMQ) General Overuse and Harm domains, and Morisky Medication Adherence Scale (MMAS-8). Other independent variables were age, gender, race (i.e. African Americans, Caucasians, Hispanic, and others), years of education, number of chronic medical conditions, number of prescription medications, and health literacy. The model adequacy was checked through diagnostic tools such as the normality of the residuals.

I. **The Regression Model for the Association between the Older Adults' Views of the Online Reviews of Medications and Their Satisfaction with Physician Communication:**

PROMEX $= \beta_0 + \beta_1$ (PCAS-Communication) $+ \beta_2$ (Age) $+ \beta_3$ (Comorbidities) $+ \beta_4$ (Education) $+ \beta_5$ (Race) $+ \beta_6$ (Health Literacy) $+ \beta_7$ (Gender) $+ \beta_8$ (Gender) $+ \beta_9$ (Marital Status) $+ \varepsilon$.

II. **The Regression Model for the Association between the Older Adults' Views of the Online Reviews of Medications and Their Quality of Life:**

PROMEX $= \beta_0 + \beta_1$ (PCS-12) $+ \beta_2$ (MCS-12) $+ \beta_3$ (PCAS-Communication) $+ \beta_4$ (Age) $+ \beta_5$ (Comorbidities) $+ \beta_6$ (Education) $+ \beta_7$ (Race) $+ \beta_8$ (Health Literacy) $+ \beta_9$ (Gender) $+ \beta_{10}$ (Marital Status) $+ \varepsilon$.

III. **The Regression Model for the Association between the Older Adults' Views of the Online Reviews of Medications and Their Beliefs about Medications:**

PROMEX $= \beta_0 + \beta_1$ (BMQ-Overuse) $+ \beta_2$ (BMQ-Harm) $+ \beta_3$ (PCAS-Communication) $+ \beta_4$ (Age) $+ \beta_5$ (Number of Prescription Medications) $+ \beta_6$ (Education) $+ \beta_7$ (Race) $+ \beta_8$ (Gender) $+ \varepsilon$.

IV. **The Regression Model for the Association between the Older Adults' Views of the Online Reviews of Medications and Their Adherence to Antihypertensive Medications:**

PROMEX $= \beta_0 + \beta_1$ (MMAS-8) $+ \beta_2$ (PCAS-Communication) $+ \beta_3$ (BMQ-Overuse) $+ \beta_4$ (BMQ-Harm) $+ \beta_5$ (Overall Rating of HTN Medications) $+ \beta_6$ (Age) $+ \beta_7$ (Comorbidities) $+ \beta_8$ (Race) $+ \beta_9$ (Health Literacy) $+ \beta_{10}$ (Gender) $+ \beta_{11}$ (Number of Prescription Medications) $+ \beta_{12}$ (Marital Status) $+ \varepsilon$.

3.7.7 The Association between Participants' Rating of Their Antihypertensive Medication Regimens and Participant-Reported Outcomes (PROs)

Since online rating of medications is an evaluation of patients' medications experiences, participants who reported having HTN were asked to complete the Morisky Medication Adherence Scale (MMAS-8) and rate their antihypertensive medications that reported taking. Multiple linear regression analyses were done to examine the association between each participant-reported outcome and participants' evaluation of their antihypertensive medications. The dependent variables were the scores of the communication domain of the PCAS, Mental and Physical Component Summaries (MCS & PCS) of the SF-12v2, Beliefs about Medicines Questionnaire (BMQ) General Overuse and Harm domains, and Morisky Medication Adherence Scale (MMAS-8). The main independent variable of interest was the participant-specific overall rating score of the

antihypertensive medication regimen. The other independent variables were age, gender, race (i.e. African Americans, Caucasians, Hispanic, and others), years of education, number of chronic medical conditions, number of prescription medications, and health literacy. All statistical analyses were conducted using SAS® 9.4 (SAS Institute, Inc., Cary, NC, USA).

I. **The Regression Model for the Association between the Overall Rating of Antihypertensive Medication Regimen and Satisfaction with Physician Communication:**

PCAS-Communication $= \beta_0 + \beta_1$ (Overall Rating of HTN Medications) $+ \beta_2$ (Age) $+ \beta_3$ (Comorbidities) $+ \beta_4$ (Education) $+ \beta_5$ (Race) $+ \beta_6$ (Health Literacy) $+ \beta_7$ (Gender) $+ \beta_8$ (Number of Prescription Medications) $+ \beta_9$ (Marital Status) $+ \varepsilon$.

II. **The Regression Model for the Association between the Overall Rating of Antihypertensive Medication Regimen and the Quality of Life:**

i. **Regression Model for the Association between the Overall Rating of Antihypertensive Medication Regimen and the PCS-12:**

PCS-12 $= \beta_0 + \beta_1$ (Overall Rating of HTN Medications) $+ \beta_2$ (Age) $+ \beta_3$ (Comorbidities) $+ \beta_4$ (Education) $+ \beta_5$ (Race) $+ \beta_6$ (Health Literacy) $+ \beta_7$ (Gender) $+ \beta_8$ (Number of Prescription Medications) $+ \beta_9$ (Marital Status) $+ \varepsilon$.

ii. **Regression Model for the Association between the Overall Rating of Antihypertensive Medication Regimen and the MCS-12:**

MCS-12 $= \beta_0 + \beta_1$ (Overall Rating of HTN Medications) $+ \beta_2$ (Age) $+ \beta_3$ (Comorbidities) $+ \beta_4$ (Education) $+ \beta_5$ (Race) $+ \beta_6$ (Health Literacy) $+ \beta_7$ (Gender) $+ \beta_8$ (Number of Prescription Medications) $+ \beta_9$ (Marital Status) $+ \varepsilon$.

III. **The Regression Model for the Association between the Overall Rating of Antihypertensive Medication Regimen and the Beliefs About Medication:**

i. **Regression Model for the Association between the Overall Rating of Antihypertensive Medication Regimen and the BMQ-Overuse:**

BMQ-overuse $= \beta_0 + \beta_1$ (Overall Rating of HTN Medications) $+ \beta_2$ (Age) $+ \beta_3$ (Comorbidities) $+ \beta_4$ (Education) $+ \beta_5$ (Race) $+ \beta_6$ (Health Literacy) $+ \beta_7$ (Gender) $+ \beta_8$ (Number of Prescription Medications) $+ \beta_9$ (Marital Status) $+ \varepsilon$.

ii. **Regression Model for the Association between the Overall Rating of Antihypertensive Medication Regimen and the BMQ-Harm:**

BMQ-Harm $= \beta_0 + \beta_1$ (Overall Rating of HTN Medications) $+ \beta_2$ (Age) $+ \beta_3$ (Comorbidities) $+ \beta_4$ (Education) $+ \beta_5$ (Race) $+ \beta_6$ (Health Literacy) $+ \beta_7$ (Gender) $+ \beta_8$ (Number of Prescription Medications) $+ \beta_9$ (Marital Status) $+ \varepsilon$.

IV. **The Regression Model for the Association between the Overall Rating of Antihypertensive Medication Regimen and Medication Adherence:**

MMAS-8 $= \beta_0 + \beta_1$ (Overall Rating of HTN Medications) $+ \beta_2$ (Age) $+ \beta_3$ (Comorbidities) $+ \beta_4$ (Education) $+ \beta_5$ (Race) $+ \beta_6$ (Health Literacy) $+ \beta_7$ (Gender) $+ \beta_8$ (Number of Prescription Medications) $+ \beta_9$ (Marital Status) $+ \varepsilon$.

3.8   Consideration of Human Subjects

The study was granted an expedited status by the institutional review board (IRB) at the University of Tennessee Health Science Center **(Appendix B)**. Although, it was not necessary for the participants to sign the consent form since no personal identifiers or access to medical records was asked for, a cover letter was included that served as consent form as well as an explanation of the research project. All completed surveys were securely maintained.

CHAPTER 4.   RESULTS

4.1   Study Sample Characteristics

Three hundred participants were recruited for the study from seven senior centers in and around Memphis, Tennessee. Out of those, 298 participants completed the PROMEX questionnaire. The number of eligible participants who were aged 60 years and over as well as reported taking one or more prescription medications was 286 participants. The participant-reported characteristics are listed in **Table 4-1**. The mean age of the participants was 72 years. Seventy-seven percent of the participants were female. Sixty-three percent of the participants were married[3]. Forty-four percent of the participants were living alone. Forty-five percent of the participants had a high school degree or less, about 41% had some college degree, and 13% had a post-graduate degree (i.e., master or PhD). Seventy-two percent of the participants had good health literacy level based on their response to the question, "How confident are you filling out medical forms by yourself?" The majority of the participants (i.e., >80%) reported taking at least two prescription medications daily. The mean number of diseases that each participant had from the listed 14 comorbidities common among the elderly was three. Almost 76% of the study participants reported having hypertension. The self-reported race was 55% Caucasians/white, 40% African Americans/black, 2% Hispanics, and 3% others[4]. With regard to the participants' preference to share the healthcare decision with their physicians', 79.1% preferred to share their decision. The participants' Short Form Health Questionnaire (SF-12v2) mental and physical component summaries (MCS-12 & PCS-12) scores, Primary Care Assessment Survey (PCAS) communication and interpersonal treatment scales scores, and Beliefs about Medicine Questionnaire general overuse and harm domains scores are listed in **Table 4-2**. The mean scores of the PCS-12 and MCS-12 of the SF-12v2 were 45.8 and 52.3, respectively. Further, the mean scores for the PCAS communication and interpersonal treatment scales were 72.8 and 72.6, respectively. Finally, the mean scores for both the BMQ-overuse and BMQ-Harm for the study sample were 12.6 and 9.03, respectively.

4.2   Item Analysis and Reliability of Patient Reviews of Medication Experiences (PROMEX)

An item analysis was performed on the seven questions of Patient Reviews of Medication Experiences (PROMEX) questionnaire. The initial Cronbach's alpha was 0.76. **Table 4-2** lists item means, standard deviations, and the minimum and maximum possible score for each item. Further, the inter-item correlation was examined to determine items that did not correlate well with one another. **Table 4-3** shows that item-7 had a poor inter-item correlation ($p \geq 0.05$) with items-1, 4, and 5. In addition, item-7 had a negative inter-item correlation with the other items on the questionnaire. Thus, item-7

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[3] The unmarried comprised of the single, divorced, widowed, separated …etc.

[4] Others were comprised of Asians and Alaska Natives.

Table 4-1.   Baseline characteristics of the participants across the senior centers.

Characteristics	Senior centers							Total (n=300)	p-Value
	Frayser-Raleigh (n=50)	Orange-Mound (n=94)	Arlington (n=24)	Bartlett (n=48)	Bert Ferguson (n=21)	McWherter (n=41)	Somerville (n=22)		
Age-yrs. (Mean ± SD)	74.98±8.32	68.25±25	73.13±7.76	72.81±7.71	74.21±6.96	73.63±9.71	72.3±8.58	71.95±8.65	0.001*
Sex									
Female	37(74%)	75(80.7%)	15(62.5%)	42(87.5%)	18(85.7%)	27(65.9%)	17(77.3%)	231(77.3%)	0.100
Male	13(26%)	18(19.4%)	9(37.5%)	6(12.5%)	3(14.3%)	14(34.2%)	5(22.7%)	68(22.7%)	
Marital status									
Married	20(40%)	24(25.8%)	16 (66.7%)	17(35.4%)	10(47.6%)	15 (36.6%)	8(36.4%)	189(63.2%)	0.017*
Unmarried	30(60%)	69(74.2%)	8 (33.3%)	31(64.5%)	11(52.4%)	26(63.4%)	14(63.6%)	110(36.8%)	
Education									
≤High school (1-12 yrs.)	23(46%)	42(44.7%)	13(54.2%)	21(43.8%)	4(19.1%)	15(36.6%)	18(81.8%)	136(45.3%)	0.014*
Some college degree (13-16 yrs.)	19(38%)	43(45.7%)	9(37.5%)	18(37.5%)	11(52.4%)	20(48.8%)	4(18.2%)	124(41.3%)	
Post-graduate degree (≥17 yrs.)	8(16%)	9(9.6%)	2(8.3%)	9(18.8%)	6(28.6%)	6(14.6%)	0(0%)	40(13.3%)	
Race									
Caucasians	40(80%)	0(0%)	24(100%)	43(91.5%)	21(100%)	32(78.1%)	4(18.2%)	164(54.9%)	<0.001*
African Americans	8(16%)	88(93.6%)	0(0%)	0(0%)	0(0%)	6(14.6%)	18(81.8%)	120(40.1%)	
Hispanics	1(2%)	2(2.1%)	0(0%)	1(2.13%)	0(0%)	2(4.9%)	0(0%)	6(2.01)	
Others	1(2%)	4(4.3%)	0(0%)	3(6.4%)	0(0%)	1(2.4%)	0(0%)	9(3.01%)	
Health literacy									
Good	42(84%)	62(66%)	0(0%)	41(85.5%)	14(66.7%)	33(80.5%)	8(36.4%)	200(72.5%)	0.001*
Marginal/limited	8(16%)	32(34%)	0(0%)	7(14.6%)	7(33.3%)	8(19.5%)	14(63.6%)	76(27.5)	
Healthcare decision sharing									
Yes	43(87.8%)	74(78.7%)	18(75%)	38(80.8%)	18(85.7%)	29(72.5%)	15(68.2%)	235(79.1%)	0.450
No	6(12.2%)	20(21.3%)	6(25%)	9(19.2%)	3(14.3%)	11(27.5%)	7(31.8%)	62(20.9%)	

Table 4-1.   Continued.

Characteristics	Senior centers							Total (n=300)	p-Value
	Frayser-Raleigh (n=50)	Orange-Mound (n=94)	Arlington (n=24)	Bartlett (n=48)	Bert Ferguson (n=21)	McWherter (n=41)	Somerville (n=22)		
Stroke	5(10%)	5(5.4%)	1(4.2%)	6(12.5%)	1(4.8%)	3(7.3%)	5(22.7%)	26(8.7%)	0.181
HTN	38(76%)	75(80.7%)	24(100%)	34(70.8%)	34(70.8%)	28(68.3%)	13(59.1%)	226(75.6%)	0.020*
Angina Pectoris or CAD	10(20%)	10(10.8%)	4(16.7%)	2(4.2%)	1(4.8%)	4(9.8%)	3(13.6%)	34(11.4%)	0.238
CHF	6(12%)	5(5.4%)	0(0%)	3(6.3%)	1(4.8%)	2(4.9%)	2(9.1%)	19(6.35%)	0.547
Myocardial Infarction (MI)	7(14%)	5(5.4%)	1(4.2%)	2(4.2%)	0(0%)	3(7.3%)	2(9.1%)	20(6.7%)	0.320
Asthma, emphysema or COPD	5(10%)	13(13.9%)	4(16.7%)	6(12.5%)	2(9.5%)	4(10%)	3(13.6%)	37(12.4%)	0.972
Diabetes	16(32%)	40(43.01%)	2(8.3%)	13(27.1%)	1(4.8%)	11(26.8%)	11(50%)	94(31.4%)	0.001*
Arthritis or any kind of rheumatism	32(64%)	48(51.6%)	13(54.2%)	25(52.1%)	13(61.9%)	22(53.7%)	13(59.1%)	166(55.5%)	0.834
Chronic back pain or sciatica	12(24%)	18(19.4%)	7(29.2%)	17(35.4%)	3(14.3%)	4(9.8%)	7(31.8%)	68(22.7%)	0.076
Depression	7(14%)	15(16.1%)	2(8.3%)	12(25%)	2(9.5%)	6(14.6%)	3(13.6%)	47(15.7%)	0.550
Chronic heart burn	4(8%)	12(12.9%)	4(16.7%)	7(14.6%)	0(0%)	5(12.2%)	7(31.8%)	39(13.04%)	0.073
Any cancer (other than skin cancer)	9(18%)	8(8.6%)	8(33.3%)	12(25%)	2(9.5%)	4(9.8%)	3(13.6%)	46(15.4%)	0.024*
Sexual dysfunction	3(6%)	7(7.5%)	2(8.3%)	1(2.1%)	2(9.5%)	1(2.4%)	2(9.1%)	18(6.02%)	0.721
IBS or stomach ulcer or indigestion	10(20%)	12(12.9%)	5(20.8%)	10(20.8%)	2(9.5%)	5(12.2%)	3(13.6%)	47(15.7%)	0.712

Table 4-1.   Continued.

Characteristics	Senior centers							Total (n=300)	p-Value
	Frayser-Raleigh (n=50)	Orange-Mound (n=94)	Arlington (n=24)	Bartlett (n=48)	Bert Ferguson (n=21)	McWherter (n=41)	Somerville (n=22)		
Comorbidity score	3.3±2.30	2.94±1.98	3.21±1.56	3.13±2.03	2.09±1.51	2.47±1.96	3.50±2.87	2.97±2.07	0.162
Living status									
Alone	25(50%)	39(42.9%)	4(16.7%)	26(54.2%)	9(42.9)	20(50%)	9(40.9%)	132(44.6%)	0.098
Not alone	25(50%)	52 (57.1%)	20(83.3%)	22(45.8%)	12(57.1%)	20(50%)	13(59.1%)	164(55.4%)	
Number of prescription medications									
0-1	12(24%)	23(24.5%)	0(0%)	5(10.4%)	3(14.3%)	8(19.5%)	4(18.2%)	55(18.3%)	0.047*
2-4	16(32%)	43(45.7%)	14(58.3%)	19(39.6%)	15(71.4%)	20(48.8%)	9(40.9%)	136(45.3%)	
5-7	16(32%)	22(23.4%)	7(29.2%)	21(43.8%)	3(14.3%)	10(24.39%)	5(22.7%)	84(28%)	
≥8	6(12%)	6(6.4%)	3(12.5%)	3(6.3%)	3(6.3%)	3(7.3%)	4(18.2%)	25(8.3%)	

Notes: Unmarried= single, divorced, widowed, and separated. Others = Asians and Alaska Natives. (*)=p-value below 0.05. Not alone includes all participants who reported living with a spouse, friend, community center, family members…etc.

Table 4-2. Item means, standard deviations, and minimum and maximum scores for each PROMEX item.

Item	Mean	SD	Min	Max
How trustworthy do you find PROMEX? (Item-1)	3.315	0.932	1.00	5.00
How likely is it for you to provide your ratings and reviews for PROMEX? (Item-2)	3.161	1.107	1.00	5.00
Would you ask your doctor to prescribe the most highly recommended medication from PROMEX? (Item-3)	3.053	1.084	1.00	5.00
How useful do you find PROMEX? (Item-4)	3.600	1.325	1.00	5.00
If you came across PROMEX like the example above how likely, is it for you to mention it to your doctor? (Item-5)	3.553	1.121	1.00	5.00
Do you believe that PROMEX will facilitate communication with your doctor? (Item-6)	3.456	1.180	1.00	5.00
How likely is it for your doctor to get upset if you mention PROMEX? (Item-7)	3.526	0.992	1.00	5.00

Table 4-3.   Pearson correlation coefficients between PROMEX items and p-values.

Item	1	2	3	4	5	6	7
1	1.00	0.462	0.409	0.508	0.508	0.627	−0.089
		<0.001	<0.001	<0.001	<0.001	<0.001	0.124
2	0.462	1.00	0.477	0.420	0.377	0.471	−0.138
	<0.001		<0.001	<0.001	<0.001	<0.001	0.016
3	0.409	0.477	1.00	0.371	0.509	0.525	−0.126
	<0.001	<0.001		<0.001	<0.001	<0.001	0.028
4	0.554	0.420	0.371	1.00	0.371	0.508	−0.113
	<0.001	<0.001	<0.001		<0.001	<0.001	0.050
5	0.508	0.377	0.509	0.625	1.00	0.627	−0.093
	<0.001	<0.001	<0.001	<0.001		<0.001	0.106
6	0.627	0.471	0.525	0.508	0.627	1.00	−0.128
	<0.001	<0.001	<0.001	<0.001	<0.001		0.026
7	−0.089	−0.138	−0.126	−0.113	−0.093	−0.128	1.00
	0.124	0.016	0.028	0.050	0.106	0.026	

was considered for removal. Moreover, the item-total statistics were examined to determine whether removing item-7 would result in an improvement in the Cronbach's alpha of the instrument. **Table 4-4** shows that item-7 has a low and negative item-total correlation (i.e., −0.15). Further, the Cronbach's alpha of the instrument improved from 0.77 to 0.85 when item-7 was deleted. Therefore, item-7 was deleted.

Principal Component Analysis was also performed to determine the number of constructs or factors that can be extracted from the questionnaire. The Kaiser's Meyer-Okin Measure of Sampling Adequacy (KMO) was 0.83, which indicates that the sample size was large enough to extract a factor or factors from this questionnaire (Cortina, 1993). According to Kaiser-Guttman rule, the number of factors to be extracted should be equal to the number of factors having an eigenvalue (i.e., variance) greater than one (Kaiser, 1960). **Table 4-5** shows that only one factor has an eigenvalue greater than one. In addition, the scree plot in **Figure 4-1** helps illustrates the rate of change in the magnitude of the eigenvalues. As can be shown in **Figure 4-1**, only one factor has an eigenvalue greater than one, and there was a significant drop in the second factor eigenvalue to less than one. Therefore, only one factor was extracted. The loading of each item on the extracted factor is shown in **Table 4-6**.

The final PROMEX instrument consists of six items after deleting item-7 due to its lack of inter-item correlation with some of the instrument items, negative and low total-item correlation. Further, the questionnaire's Cronbach's alpha was significantly improved after deleting item-7 (i.e.,0.85) (Field, 2009). Varimax rotation was not performed because only one factor was extracted (Hatcher, 2005). This factor was named the "value of online medication rating websites to older adults". The minimum possible score of PROMEX is six and the maximum possible score is 30 after excluding item-7. The higher the score of PROMEX, the more useful participants believe online medication rating websites are.

4.3   Patient Reviews of Medication Experiences (PROMEX)

The mean scores of PROMEX for the different sociodemographic groups are listed in **Table 4-7**. The overall mean and standard deviation scores of PROMEX for study participants was 20.14±5.16 and participants from the different age groups did not have significantly different PROMEX mean scores (p=0.921). Therefore, participants from the different age groups viewed the online medication rating websites similarly. Likewise, male and female participants did not have significantly different PROMEX mean scores (p=0.511). Thus, male and female participants viewed the online medication rating websites in a similar way. Further, the number of prescription medications that participants take daily did not influence their views of online medication rating websites. The study participants with one or no medical condition (i.e., comorbidity score≤1) did not have a significantly different PROMEX mean score than those with more than one medical condition (i.e., comorbidity score >1) (p=0.270). Hence, the number of medical conditions or the comorbidity score for each participant did not influence their views of

Table 4-4.   **Cronbach coefficient alpha with deleted PROMEX item.**

Deleted item	Raw item		Standardized item	
	Correlation with total	Alpha	Correlation with total	Alpha
How trustworthy do you find PROMEX? (Item-1)	0.655	0.725	0.646	0.707
How likely is it for you to provide your ratings and reviews for PROMEX? (Item-2)	0.530	0.744	0.527	0.733
Would you ask your doctor to prescribe the most highly recommended medication from PROMEX? (Item-3)	0.559	0.739	0.555	0.727
How useful do you find PROMEX? (Item-4)	0.616	0.724	0.614	0.714
If you came across PROMEX like the example above how likely, is it for you to mention it to your doctor? (Item-5)	0.684	0.712	0.671	0.702
Do you believe that PROMEX will facilitate communication with your doctor? (Item-6)	0.695	0.707	0.695	0.696
How likely is it for your doctor to get upset if you mention PROMEX? (Item-7)	−0.151	0.853	−0.150	0.856

Table 4-5. **Eigenvalues of the correlation matrix.**

Factor	Eigenvalue	Difference	Proportion	Cumulative
1	3.505	2.779	0.584	0.584
2	0.725	0.122	0.121	0.705
3	0.602	0.093	0.101	0.805
4	0.509	0.132	0.084	0.890
5	0.376	0.095	0.062	0.953
6	0.280		0.046	1.000
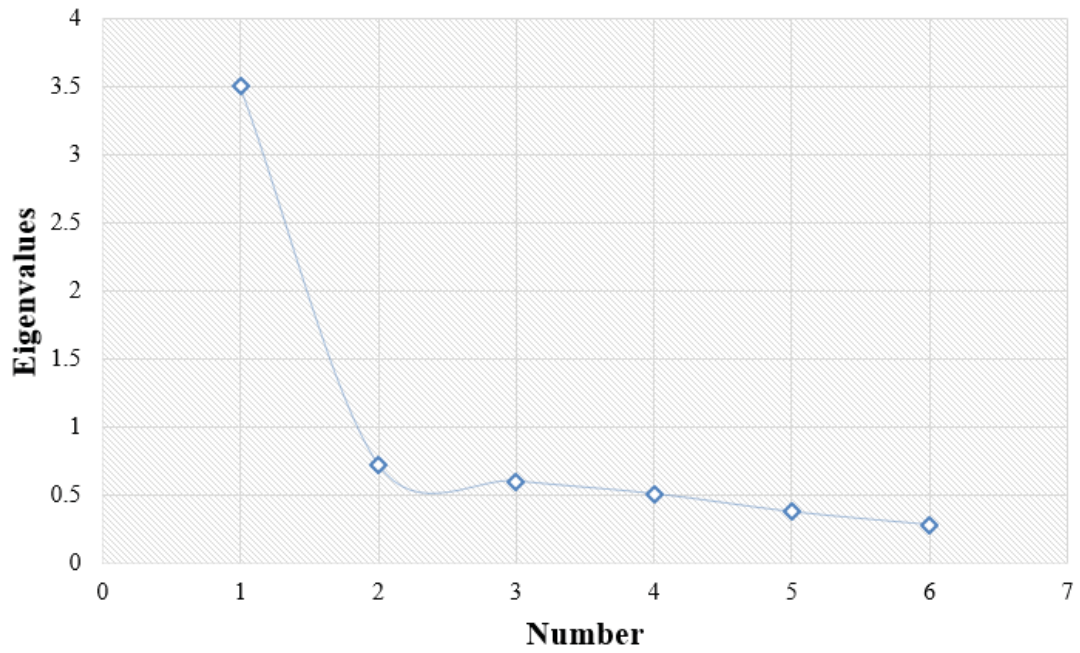
Figure 4-1. Scree plot of the possible number of factors that can be extracted from the 6-items PROMEX questionnaire.

Table 4-6. **Loading of each item of PROMEX on the extracted factor.**

Items	Factor-1
Item 6: Do you believe that PROMEX will facilitate communication with your doctor?	0.830
Item 5: If you came across PROMEX like the example above how likely, is it for you to mention it to your doctor?	0.804
Item 1: How trustworthy do you find PROMEX?	0.783
Item 4: How useful do you find PROMEX?	0.762
Item 3: Would you ask your doctor to prescribe the most highly recommended medication from PROMEX?	0.709
Item 2: How likely is it for you to provide your ratings and reviews for PROMEX?	0.685

Table 4-7. Patient Reviews of Medication Experiences (PROMEX) scores of different sociodemographic subgroups (n=298).

| Characteristics | PROMEX score | | | | | p-Value |
	n	Min	Median	Mean ±SD	Max	
Age						
50-60 yrs.	25	6	21.0	20.80±5.85	30	0.921
61-70 yrs.	117	7	21.0	20.12±5.12	30	
71-80 yrs.	97	7	21.0	20.07±5.03	30	
>80 yrs.	54	7	20.5	19.96±5.15	28	
Number of prescription medications						
0-1	55	7	21.0	19.98±5.73	29	0.744
2-4	136	6	21.0	19.89±5.11	30	
5-7	82	7	20.0	20.39±4.73	30	
≥8	25	9	21.0	21.00±5.61	30	
Sex						
Male	68	7	21.0	20.50±5.46	30	0.511
Female	229	6	21.0	20.03±5.08	30	
Living status						
Alone	131	6	21.0	20.09±5.45	30	0.879
Not alone	163	7	21.0	20.18±4.97	29	
Marital status						
Unmarried	187	6	21.0	20.21±5.41	30	0.759
Married	110	7	20.0	20.02±4.75	29	
Comorbidity score						
≤1	74	7	21.0	19.57±5.72	29	0.270
>1	224	6	21.0	20.33±4.95	30	
Race						
Caucasians	163	6	20.0	19.57±4.91	30	0.205
African Americans	119	7	21.0	20.87±5.32	30	
Hispanics	6	9	22.0	19.67±6.00	27	
Others	9	8	21.0	21.00±6.66	29	
Education						
≤High school (1-12 yrs.)	135	7	21.0	20.45±4.66	30	0.617
Some college degree (13-16 yrs.)	124	6	20.0	19.82±5.49	30	
Post-graduate degree (≥17 yrs.)	39	8	21.0	20.08±5.73	29	
Health literacy						
Marginal/limited	76	9	21.0	20.30±5.18	29	0.813
Good	199	6	21.0	20.14±5.24	30	

Table 4-7.   Continued.

Characteristics	PROMEX score					p-Value
	n	Min	Median	Mean ±SD	Max	
Healthcare decision sharing						
No	61	6	20.0	19.07±5.18	30	0.080
Yes	234	7	21.0	20.36±5.13	30	
Healthcare decision sharing preference						
Keep control in my own hand	34	6	20.0	19.38±5.38	30	0.187
Have an equal partnership	234	7	21.0	20.36±5.13	30	
Leave it in the doctor's hands	27	9	19.5	18.67±4.99	30	

Note: (*) =p<0.05.

online rating of medication websites. In addition, the PROMEX mean scores were not significantly different across the different marital and living status groups (p=0.879). Moreover, PROMEX mean scores were not significantly different between the different education, health literacy and racial subgroups (p≥0.05). Finally, the PROMEX mean scores were not significantly different between the different health decision sharing and preference groups (p=0.08).

4.4   The Health-Related Quality of Life (HRQoL)

4.4.1   The SF-12v2 Physical Component Summary (PCS-12)

The number of the participants who completed the Physical Component Summary (PCS-12) section of the SF-12v2 survey was 298 participants. The mean scores of the PCS-12 for the different sociodemographic subgroups are listed in **Table 4-8**. As the number of prescription medications a participant took daily increased, the PCS-12 mean score decreased. Participants who were taking one or more prescription medications had significantly lower PCS-12 mean scores than participants on one prescription medication or not on any prescription medications (p<0.001). Therefore, participants who were taking multiple prescription medications report lower physical health or physical HRQoL than participants taking only one medication or not taking any prescription medications. Similarly, participants with more than one medical condition had a significantly lower PCS-12 mean score than participants with no medical conditions or with only one medical condition (p<0.001). Hence, participants with multiple comorbidities had lower physical health or physical HRQoL than those with one or no comorbidities. Participants with some college or post-graduate degrees had significantly higher PCS-12 mean scores than those with high school diploma or lower (p=0.011). Thus, participants with higher educations (i.e., some college or post-graduate degrees) reported better physical health or physical HRQoL than participants with lower educations (i.e., high school diploma or lower). The mean scores of the PCS-12 were not significantly different across age, sex, marital status, living status, racial, health literacy, and health decision sharing preference subgroups (p≥0.05).

4.4.2   The SF-12v2 Mental Component Summary (MCS-12)

The number of participants who completed the Mental Component Summary (MCS-12) section of the SF-12v2 survey was 298 participants. The mean scores of the SF-12v2 Mental Component Summary (MCS-12) for the different sociodemographic subgroups are listed in **Table 4-9**. The mean scores of the MCS-12 for the study participants aged 61 years and above were significantly higher than those aged 60 or less years (p=0.001). Participants whose age was between 71 and 80 years had the highest mental health or mental HRQoL compared to the other age subgroups. Further, married participants had a significantly higher MCS-12 mean score compared to the unmarried participants (p=0.039). In addition, the mean score of the MCS-12 for participants with good health

Table 4-8.   SF-12v2 Physical Component Summary (PCS-12) scores of different sociodemographic subgroups (n=298).

Characteristics	n	Min	Median	Mean ±SD	Max	p-Value
			PCS-12 score			
Age						
50-60 yrs.	25	26	46.3	47.16±9.62	60	0.285
61-70 yrs.	117	24	48.9	46.84±10.3	67	
71-80 yrs.	97	22	45.0	45.12±9.47	63	
>80 yrs.	54	13	44.3	43.99±11.3	61	
Number of prescription medications						
0-1	55	28	55.9	52.04±8.54	63	<0.001*
2-4	136	13	46.5	45.70±9.44	61	
5-7	82	22	44.3	44.11±10.4	67	
≥8	25	26	38.8	38.47±9.51	53	
Sex						
Male	68	24	44.8	44.73±9.45	63	0.298
Female	229	13	47.2	46.19±10.4	67	
Living status						
Alone	131	21	48.9	46.89±9.82	63	0.095
Not alone	163	13	44.9	44.9±10.37	67	
Marital status						
Unmarried	187	13	47.1	46.24±10.3	67	0.396
Married	110	24	46.2	45.20±9.91	61	
Comorbidity score						
≤1	74	30	53.8	51.56±7.49	63	<0.001*
>1	224	13	43.8	43.94±10.2	67	
Race						
Caucasians	163	21	48.0	46.15±10.2	30	0.781
African Americans	119	13	45.1	45.40±9.92	30	
Hispanics	6	33	46.0	47.14±11.5	27	
Others	9	22	44.7	43.17±12.8	29	

Table 4-8.　　Continued.

Characteristics	PCS-12 score					p-Value
	n	Min	Median	Mean ±SD	Max	
Education						
≤High school (1-12 yrs.)	135	13	43.5	44.18±9.65	61	0.011*
Some college degree (13-16 yrs.)	124	21	51.1	47.88±10.2	67	
Post-graduate degree (≥17 yrs.)	39	24	47.8	45.03±10.7	61	
Health literacy						
Marginal/limited	76	21	44.2	44.68±9.18	67	0.121
Good	199	13	48.9	46.78±10.4	63	
Healthcare decision sharing						
No	61	26	45.7	45.46±9.21	61	0.668
Yes	234	13	47.2	46.08±10.3	67	
Healthcare decision sharing preference						
Keep control in my own hand	34	28	49.6	47.25±9.27	59	0.273
Have an equal partnership	234	13	47.2	46.08±10.3	67	
Leave it in the doctor's hands	27	26	43.0	43.21±8.80	61	

Note: (*) =p<0.05.

Table 4-9.   SF-12v2 Mental Component Summary (MCS-12) scores of different sociodemographic subgroups (n=298).

Characteristics	MCS-12 score					p-Value
	n	Min	Median	Mean ±SD	Max	
Age						
50-60 yrs.	25	26	47.5	45.63±9.80	58	0.001*
61-70 yrs.	117	30	55.5	52.05±9.88	68	
71-80 yrs.	97	29	58.5	54.99±9.13	72	
>80 yrs.	54	33	53.4	52.49±8.46	73	
Number of prescription medications						
0-1	55	30	54.8	52.78±8.87	72	0.763
2-4	136	29	54.4	51.69±9.61	73	
5-7	82	26	55.2	53.07±9.72	69	
≥8	25	25	56.7	52.35±12.9	67	
Sex						
Male	68	25	53.0	50.11±11.3	72	0.053
Female	229	26	55.8	53.04±9.21	73	
Living status						
Alone	131	25	53.1	51.68±9.64	69	0.235
Not alone	163	26	55.8	53.04±9.87	73	
Marital status						
Unmarried	187	25	53.0	51.47±9.91	73	0.039*
Married	110	29	56.8	53.90±9.41	72	
Comorbidity score						
≤1	74	30	56.6	52.95±8.98	67	0.530
>1	224	25	54.3	52.12±10.1	73	
Race						
Caucasians	163	25	56.9	53.53±9.13	72	0.067
African Americans	119	26	52.4	51.02±10.4	73	
Hispanics	6	34	46.5	46.02±9.82	58	
Others	9	36	51.7	51.50±11.9	69	

Table 4-9.   Continued.

Characteristics	n	Min	Median	Mean ±SD	Max	p-Value
			MCS-12 score			
Education						
≤High school (1-12 yrs.)	135	26	52.7	51.04±10.5	73	0.077
Some college degree (13-16 yrs.)	124	25	56.2	53.0±9.24	72	
Post-graduate degree (≥17 yrs.)	39	31	55.3	54.64±8.42	68	
Health literacy						
Marginal/limited	76	26	48.1	48.02±10.5	69	<0.001
Good	199	25	55.6	53.23±9.13	73	
Healthcare decision sharing						
No	61	25	51.8	50.29±11.3	72	0.060
Yes	234	29	55.8	52.93±9.28	73	
Healthcare decision sharing preference						
Keep control in my own hand	34	25	53.9	50.91±11.7	72	0.147
Have an equal partnership	234	29	55.8	52.93±9.28	73	
Leave it in the doctor's hands	27	26	48.1	49.51±11.0	65	

Note: (*) =p<0.05.

literacy was significantly higher than the one for participants with limited health literacy (p<0.001). Finally, the mean scores of the MCS-12 were not significantly different across the different sex, comorbidities, number of prescription medications, living status, educations, racial, and health decision sharing preference subgroups (p≥0.05).

4.5 Satisfaction with Physician Communication and Interpersonal Treatment

4.5.1 The Primary Care Assessment Survey-Communication Scale (PCAS-Communication)

The number of the study participants who completed the Primary Care Assessment Survey Communication domain (PCAS-Communication) was 300. The PCAS-Communication scale mean scores for the different sociodemographic groups are listed in **Table 4-10**. The mean score of the PCAS-Communication for female participants was significantly higher than the score for male participants (p=0.048). Female participants were more satisfied with the physician communication than their male counterparts were. Married participants also had a significantly higher PCAS-Communication mean score than the unmarried participants (p=0.013). Married participants were more satisfied with the physician communication compared to the unmarried participants. Further, the mean score of the PCAS-Communication for Caucasians was significantly higher than the scores for African Americans, Hispanics, and other racial subgroups (p=0.041). The Caucasian participants had the highest satisfaction level with the physician communication among the other racial subgroups. Hispanics had the lowest satisfaction level with the physician communication among the other racial subgroups. In addition, participants with good health literacy level had a significantly higher PCAS-Communication mean score than participants with limited health literacy (p=0.001). Finally, the mean scores of PCAS-Communication scores across the different age, number of prescription medications, living status, comorbidity score, education, healthcare decision sharing, and healthcare decision sharing preference subgroups were not significantly different (p≥0.05).

4.5.2 The PCAS-Interpersonal Treatment Scale

The number of the study participants who completed the Primary Care Assessment Survey Interpersonal Treatment domain (PCAS-Interpersonal Treatment) was 300. The PCAS-interpersonal treatment scale mean scores for the different sociodemographic subgroups are listed in **Table 4-11**. Married participants had a significantly higher PCAS-interpersonal treatment mean score than the unmarried participants did (p=0.029). Therefore, the married participants' level of satisfaction with the physician interpersonal treatment was significantly higher than the level of satisfaction for the unmarried. However, the mean scores of the PCAS-interpersonal treatment did not significantly differ across the age, education, living status, number of prescription medications, sex, comorbidities, race, health literacy, healthcare decision sharing, and healthcare decision

Table 4-10. **Primary Care Assessment Survey (PCAS-Communication) scale (n=300).**

Characteristics	PCAS-Communication scale score					p-Value
	n	Min	Median	Mean ±SD	Max	
Age						
50-60 yrs.	25	10	68.0	68.53±21.4	100	0.133
61-70 yrs.	117	28	76.7	73.85±16.9	100	
71-80 yrs.	98	20	75.0	74.95±16.8	100	
>80 yrs.	55	30	66.7	69.33±17.1	100	
Number of prescription medications						
0-1	55	10	76.7	73.78±17.7	100	0.295
2-4	136	30	73.3	71.55±16.9	100	
5-7	84	20	76.7	75.27±17.8	100	
≥8	25	40	70.0	69.07±17.6	100	
Sex						
Male	68	30	66.7	69.11±16.5	100	0.048*
Female	231	10	73.3	73.85±17.6	100	
Living status						
Alone	132	10	70.0	70.93±18.4	100	0.092
Not alone	164	28	76.7	74.37±16.5	100	
Marital status						
Unmarried	189	10	70.0	70.87±18.2	100	0.013*
Married	110	30	80.0	76.04±15.6	100	
Comorbidity score						
≤1	74	20	75.0	73.53±17.9	100	0.676
>1	226	10	73.3	72.55±17.3	100	
Race						
Caucasians	164	30	76.7	74.59±17.5	100	0.041*
African Americans	120	10	73.3	71.77±17.3	100	
Hispanics	6	43	60.0	60.56±14.9	87	
Others	9	37	60.0	62.59±12.3	80	

Table 4-10. Continued.

Characteristics	PCAS-Communication scale score					p-Value
	n	Min	Median	Mean ±SD	Max	
Education						
≤High school (1-12 yrs.)	136	28	70.0	71.66±16.2	100	0.346
Some college degree (13-16 yrs.)	124	20	73.3	72.94±17.9	100	
Post-graduate degree (≥17 yrs.)	40	10	80.0	76.22±19.5	100	
Health literacy						
Marginal/limited	76	30	66.7	66.77±15.8	97	0.001*
Good	200	10	76.7	74.97±17.5	100	
Healthcare decision sharing						
No	62	36	67.3	70.61±18.4	100	0.263
Yes	235	10	73.3	73.41±17.2	100	
Healthcare decision sharing preference						
Keep control in my own hand	34	36	67.3	67.88±16.9	100	0.213
Have an equal partnership	235	10	73.3	73.41±17.2	100	
Leave it in the doctor's hands	28	40	70.0	73.93±19.8	100	

Note: (*) =p<0.05.

Table 4-11.   Primary Care Assessment Survey (PCAS-Interpersonal Treatment) scale (n=300).

Characteristics	PCAS-Interpersonal Treatment scale score					p-Value
	n	Min	Median	Mean ±SD	Max	
Age						
50-60 yrs.	25	40	68.0	71.96±20.3	100	0.618
61-70 yrs.	117	27	76.0	72.84±18.9	100	
71-80 yrs.	98	27	76.0	74.31±17.8	100	
>80 yrs.	55	35	72.0	70.27±16.3	100	
Number of prescription medications						
0-1	55	40	76.0	73.36±21.1	100	0.605
2-4	136	27	72.0	71.75±17.3	100	
5-7	84	27	76.0	74.37±17.7	100	
≥8	25	28	68.0	69.60±18.4	100	
Sex						
Male	68	27	74.0	69.35±17.6	100	0.084
Female	231	27	76.0	73.68±18.3	100	
Living status						
Alone	132	27	72.0	70.87±18.8	100	0.099
Not alone	164	27	76.0	74.37±17.6	100	
Marital status						
Unmarried	189	27	72.0	70.95±18.6	100	0.029*
Married	110	28	80.0	75.69±17.2	100	
Comorbidity score						
≤1	74	27	72.0	72.00±19.8	100	0.742
>1	226	27	76.0	72.80±17.7	100	
Healthcare decision sharing						
No	62	28	72.0	71.77±18.9	100	0.668
Yes	235	27	76.0	72.90±18.1	100	

Table 4-11.   Continued.

Characteristics	PCAS-Interpersonal Treatment scale score					p-Value
	n	Min	Median	Mean ±SD	Max	
Education						
≤High school (1-12 yrs.)	136	28	72.0	71.53±17.2	100	0.205
College degree (13-16 yrs.)	124	27	76.0	72.26±19.6	100	
Post-graduate degree (≥17 yrs.)	40	40	80.0	77.30±16.9	100	
Race						
Caucasians	164	35	76.0	73.85±18.3	100	0.059
African Americans	120	27	75.5	72.57±18.1	100	
Hispanics	6	44	60.0	62.67±18.4	88	
Others	9	40	60.0	59.22±12.9	76	
Health literacy						
Marginal/limited	76	28	72.0	69.37±17.4	100	0.056
Good	200	27	76.0	74.04±18.4	100	
Healthcare decision sharing preference						
Keep control in my own hand	34	40	66.0	68.53±19.3	100	0.278
Have an equal partnership	235	27	76.0	72.90±18.1	100	
Leave it in the doctor's hands	28	28	74.0	75.71±18.2	100	

Note: (*) =p<0.05.

sharing preference subgroups (p≥0.05).

4.6 The General Domains of Beliefs about Medicines Questionnaire (BMQ)

4.6.1 BMQ-Overuse Scale

The number of the participants who completed the Beliefs about Medicine Questionnaire-Overuse scale was 297. The BMQ-Overuse scale mean scores across the different sociodemographic subgroups are listed in **Table 4-12**. Participants who reported taking zero or only one prescription medication had significantly higher BMQ General-Overuse mean scores than other participants who reported taking multiple prescription medications (p=0.016). As the number of prescription medications participants were taking increased, their belief that medications are overprescribed or overused decreased. Female participants had a significantly higher BMQ General-Overuse mean score than their male counterparts (p=0.009). Hence, female participants' beliefs about medications being overused or overprescribed were stronger than their male counterparts. Further, the mean scores of the BMQ General-Overuse for participants who liked to be involved in the health decision along with the physicians or have an equal partnership, and those who liked to keep the health decision in their own hands were significantly higher than the participants who liked to keep the health decision in the physicians' hands (p=0.017). Participants who liked to be involved with physicians' in the health decision or have an equal partnership held the strongest beliefs that medications are overprescribed or overused; however, participants who liked to leave the health decision in the physicians' hands had the weakest beliefs than medications are overprescribed or overused. Finally, the mean scores of the BMQ General-Overuse for the different age, education, marital and living status, comorbidities, race, and health literacy groups were not significantly different (p≥0.05).

4.6.2 BMQ-Harm Scale

The number of the participants who completed the Beliefs about Medicine Questionnaire-Harm scale was 298. The BMQ-Harm scale mean scores across the different sociodemographic subgroups are listed in **Table 4-13**. The participants who reported taking zero or one prescription medication had the highest BMQ-Harm mean score compared to the mean scores of those taking multiple medications (p=0.038). As the number of prescription medications taken by the participants increased, their belief that prescription medications are inherently harmful decreased. The Caucasian/white participants had the lowest BMQ-Harm mean score in comparison to the other racial groups (p=0.014). Hence, the Caucasian participants' beliefs that prescription medications are generally harmful were not as strong as the beliefs of other racial groups. On the other hand, Asians and Alaska Natives (i.e., Others) held the strongest beliefs that medications are generally harmful in comparison to other racial groups (p=0.014). The mean scores of BMQ-Harm across other sociodemographic, comorbidities, health

Table 4-12. Beliefs about Medicines Questionnaire-Overuse (BMQ-Overuse) scale scores of different sociodemographic subgroups (n=297).

Characteristics	BMQ-Overuse score					p-Value
	n	Min	Median	Mean ±SD	Max	
Age						
50-60 yrs.	25	4	13.0	12.48±3.74	19	0.592
61-70 yrs.	116	4	13.0	12.62±2.77	18	
71-80 yrs.	98	5	13.0	12.91±3.20	20	
>80 yrs.	53	6	12.0	12.23±2.46	18	
Number of prescription medications						
0-1	55	4	14.0	13.49±3.65	20	0.016*
2-4	134	4	13.0	12.66±2.80	20	
5-7	83	6	13.0	12.23±2.63	17	
≥8	25	4	12.0	11.40±3.21	16	
Sex						
Male	68	4	12.0	11.78±2.96	16	0.009*
Female	228	4	13.0	12.86±2.96	20	
Living status						
Alone	131	4	13.0	12.81±3.12	20	0.277
Not Alone	162	4	13.0	12.43±2.90	20	
Marital status						
Unmarried	86	4	13.0	12.80±2.98	20	0.149
Married	110	4	12.0	12.28±2.99	20	
Comorbidity score						
≤1	74	4	13.0	12.93±3.13	19	0.257
>1	223	4	13.0	12.48±2.96	20	
Race						
Caucasians	162	5	12.5	12.56±2.84	20	0.895
African Americans	120	4	13.0	12.65±3.21	19	
Hispanics	5	7	12.0	11.60±4.16	16	
Others	9	7	13.0	12.56±2.60	18	

Table 4-12.   Continued.

Characteristics	BMQ-Overuse score					p-Value
	n	Min	Median	Mean ±SD	Max	
Education						
≤High school (1-12 yrs.)	133	4	12.0	12.32±3.19	20	0.313
College degree (13-16 yrs.)	124	4	13.0	12.89±2.95	19	
Post-graduate degree (≥17 yrs.)	40	7	12.5	12.58±2.45	17	
Health literacy						
Marginal/limited	76	4	13.0	12.79±3.40	20	0.480
Good	198	4	13.0	12.48±2.78	18	
Healthcare decision sharing						
No	60	4	12.5	11.93±3.80	20	0.118
Yes	235	5	13.0	12.76±2.76	20	
Healthcare decision sharing preference						
Keep control in my own Hand	34	4	13.5	12.65±3.76	20	0.017*
Have an equal partnership	235	5	13.0	12.76±2.76	20	
Leave it in the doctor's hands	26	4	10.5	11.0±3.71	17	

Note: (*) =p<0.05.

Table 4-13.   Beliefs about Medicines Questionnaire-Harm (BMQ-Harm) scale scores of different sociodemographic subgroups (n=298).

Characteristics		BMQ-Harm score				p-Value
	n	**Min**	**Median**	**Mean ±SD**	**Max**	
Age						
50-60 yrs.	25	4	10.0	9.92±3.38	17	0.062
61-70 yrs.	115	4	9.0	9.35±2.91	18	
71-80 yrs.	98	4	8.0	8.71±2.62	14	
>80 yrs.	55	4	8.0	8.45±2.79	18	
Number of prescription medications						
0-1	55	4	9.0	9.80±3.00	18	0.038*
2-4	135	4	9.0	8.99±2.79	17	
5-7	84	4	8.5	8.92±2.72	17	
≥8	24	4	7.5	7.83±3.06	16	
Sex						
Male	67	4	9.0	8.66±2.36	13	0.177
Female	230	4	9.0	9.13±2.99	18	
Living Status						
Alone	131	4	9.0	9.02±2.94	17	0.963
Not Alone	163	4	9.0	9.03±2.84	18	
Marital Status						
Unmarried	187	4	9.0	8.98±2.79	17	0.756
Married	110	4	9.0	9.09±3.00	18	
Comorbidity Score						
≤1	74	4	9.0	9.15±2.77	18	0.673
>1	224	4	9.0	8.99±2.89	18	
Race						
Caucasians	164	4	8.0	8.55±2.60	16	0.014*
African Americans	118	4	9.0	9.53±3.01	18	
Hispanics	6	4	9.0	9.17±4.96	13	
Others	9	5	11.0	10.44±2.46	18	

Table 4-13.   Continued.

Characteristics	BMQ-Harm score					p-Value
	n	Min	Median	Mean ±SD	Max	
Education						
≤High school (1-12 yrs.)	134	4	9.0	9.37±2.74	18	0.148
College degree (13-16 yrs.)	124	4	9.0	8.81±2.93	18	
Post-graduate degree (≥17 yrs.)	40	4	8.0	8.55±2.95	16	
Health literacy						
Marginal/limited	76	4	9.5	9.51±3.00	17	0.115
Good	198	4	8.5	8.90±2.83	18	
Healthcare decision sharing						
No	62	4	9.0	9.52±3.43	18	0.185
Yes	233	4	9.0	8.89±2.69	18	
Healthcare decision sharing preference						
Keep control in my own hand	34	4	9.5	9.74±3.49	18	0.248
Have an equal partnership	233	4	9.0	8.89±2.69	18	
Leave it in the doctor's hands	28	4	9.0	9.25±3.40	16	

Note: (*) =$p<0.05$.

literacy, and health decision sharing preference groups were not significantly different (p≥0.05).

4.7   The Hypertensive Study Sample Characteristics

The number of participants who reported having hypertension was 226 (75.3%). Out of this sample, 218 reported taking prescription medications for hypertension. The sociodemographic characteristics of the hypertensive study sample who reported taking antihypertensive medications are listed in **Table 4-14**. The mean age of this sample was 72 years, 76.6% of the study sample were female; 63.8% were unmarried; 54% had either some college or postgraduate degrees. The self-reported race of the sample was 55% Caucasians/white, 40% African Americans/black, 2% Hispanics, and 3% Others (i.e., Asians and Alaska Natives). Forty-four percent were living alone, while 56% were not. Finally, more than 90% of the participants were taking more than two prescription medications.

4.8   Medication Adherence Levels among the Hypertensive Sample

Adherence to antihypertensive medication regimens were categorized into three distinct categories based on Morisky Medication Adherence Scale (MMAS-8) scores. High medication adherence level is achieved when the MMAS-8 score is eight. However, medium and low adherence levels are achieved when the MMAS-8 scores are between six and less than eight, and less than six, respectively (Krousel-Wood et al., 2009; Morisky et al., 2008; Morisky & DiMatteo, 2011). The adherence levels to antihypertensive medication regimens among the hypertensive sample across the seven senior centers are listed in **Table 4-15**. The proportion of the sample with high, medium, and low adherence levels to their antihypertensive medication regime was 49%, 30%, and 21%, respectively. Further, the hypertensive participants were categorized into adherent and non-adherent based on their MMAS-8 scores. If the MMAS-8 score is eight, then participant was considered adherent to his/her antihypertensive medication regimen, however, if the MMAS-8 score is less than eight, then the participant was considered non-adherent to his/her antihypertensive medication regimen (Wong et al., 2014). The adherence levels across the different sociodemographic and medical groups are listed in **Table 4-16**. The proportion of adherent participants among the hypertensive sample significantly increased as their age increased (p<0.001). The majority of the participants aged 71 years and above were adherent to their antihypertensive medication regimens (i.e., >60%); however, less than 33% of the participants aged 70 years and less were adherent. In addition, the proportion of adherent participants among the Caucasians was significantly higher than the non-adherent participants (p=0.021). Further, most of the Caucasians/white participants were adherent to their antihypertensive medication regimens (i.e., 58%) in comparison to 40% of the African Americans, 20% of Hispanics, and 29% of other racial subgroups (i.e., Asians and Alaska Natives). Finally, the proportions of adherent participants were not significantly different across the remaining sociodemographic and medical subgroups (p≥0.05).

Table 4-14. Baseline characteristics of the hypertensive participants (n=218).

Characteristics	Senior centers							Total (n=218)	p-Value
	Frayser-Raleigh (n=36)	Orange-Mound (n=71)	Arlington (n=24)	Bartlett (n=33)	Bert Ferguson (n=14)	McWherter (n=28)	Somerville (n=12)		
Age-yrs. (Mean ± SD)	76.25±8.35	69.43±8.51	73.13±7.76	72.13±7.32	75.38±7.25	72.96±10.68	70.17±6.59	72.25±8.65	0.005*
Sex									
Female	25(69.4%)	56(78.9%)	15(62.5%)	29(87.9%)	13(92.9%)	20(71.4%)	9(75%)	167(76.6%)	0.188
Male	11(30.6%)	15(21.1%)	9(37.5%)	4(12.1%)	1(7.1%)	8(28.6%)	3(25%)	51(23.4%)	
Marital status									
Married	13(36.1%)	16(22.5%)	16 (66.7%)	12(36.4%)	7(50%)	10(35.7%)	5(41.7%)	79(36.2%)	0.010*
Unmarried	23(63.9%)	55(77.5%)	8(33.3%)	21(63.6%)	7(50%)	18(64.3%)	7(58.3%)	139(63.8%)	
Education									
≤High school (1-12 yrs.)	17(47.2%)	35(49.3%)	13(54.2%)	16(48.5%)	2(14.3%)	9(32.1%)	9(75%)	101(46.3%)	0.075
Some college degree (13-16 yrs.)	15(41.7%)	30(42.3%)	9(37.5%)	12(36.4%)	7(50%)	16(57.1%)	3(25%)	92(42.2%)	
Post-graduate degree (≥17 yrs.)	4(11.1%)	6(8.5%)	2(8.3%)	5(15.2%)	5(35.7%)	3(10.7%)	0(0%)	25(11.5%)	
Race									
Caucasians	29(80.6%)	0(0%)	24(100%)	29(87.9%)	14(100%)	21(75%)	2(16.7%)	119(54.6%)	<0.001*
African Americans	5(13.9%)	66(92.9%)	0(0%)	0(0%)	0(0%)	6(21.4%)	10(83.3%)	87(39.9%)	
Hispanics	1(2.8%)	2(2.8%)	0(0%)	1(3%)	0(0%)	1(3.6%)	0(0%)	5(2.3%)	
Others	1(2.8%)	3(4.2%)	0(0%)	3(9.1%)	0(0%)	0(0%)	0(0%)	7(3.2%)	
Living status									
Alone	20(55.6%)	31(44.3%)	4(16.7%)	16(48.5%)	6(42.9%)	13 (48.1%)	5(41.7%)	95(43.98%)	0.136
Not alone	16(44.4%)	39(55.7%)	20(83.3%)	17(51.5%)	8(57.1%)	14 (51.9%)	7(58.3%)	121(56.02%)	

Table 4-14.   Continued.

Characteristics	Senior centers							Total (n=218)	p-Value
	Frayser-Raleigh (n=36)	Orange-Mound (n=71)	Arlington (n=24)	Bartlett (n=33)	Bert Ferguson (n=14)	McWherter (n=28)	Somerville (n=12)		
Number of prescription medications									
0-1	4(11.1%)	8(11.3%)	0(0%)	0(0%)	1(7.1%)	3(10.7%)	1(8.3%)	17(7.8%)	0.116
2-4	13(36.1%)	38(53.5%)	14(58.3%)	13(39.4%)	10(71.4%)	12(42.9%)	4(33.3%)	104(47.7%)	
5-7	15(41.7%)	20(28.2%)	7(29.2%)	17(51.5%)	3(21.4%)	10(35.7%)	3(25%)	75(34.4%)	
≥8	4(11.1%)	5(7.0%)	3(12.5%)	3(9.1%)	0(0%)	3(10.7%)	4(33.3%)	22(10.1%)	

Note: (*) =p<0.05.

Table 4-15. **Morisky Medication Adherence Scale (MMAS-8) levels among the hypertensive sample (n=218).**

Adherence level	Senior centers							Total (n=218)	p-Value
	Frayser-Raleigh (n=36)	Orange-Mound (n=71)	Arlington (n=24)	Bartlett (n=33)	Bert Ferguson (n=14)	McWherter (n=28)	Somerville (n=12)		
High (MMAS-8 score= 8)	21(58.3%)	28(39.4%)	10(41.7%)	20(60.6%)	9(64.3%)	12(42.9%)	7(58.3%)	107(49.1%)	0.005*
Medium (MMAS-8 score = 6-<8)	10(27.8%)	21(29.6%)	9(37.5%)	10(30.3%)	5(35.7%)	7(25%)	4(33.3%)	66(30.3%)	
Low (MMAS-8 score <6)	5(13.9%)	22(31.0%)	5(20.8%)	3(9.1%)	0(0%)	9(32.14%)	1(8.3%)	45(20.6%)	

Note: (*) =$p<0.05$.

Table 4-16.   Morisky Medication Adherence Scale (MMAS-8) levels across the hypertensive subgroups.

Characteristics	Non-adherent (MMAS-8 <8) (n)	Adherent (MMAS-8 =8) (n)	p-Value
Age			
50-60 yrs.	13(72.2%)	5(27.8%)	<0.001*
61-70 yrs.	55(66.3%)	28(33.7%)	
71-80 yrs.	28(38.4%)	45(61.6%)	
>80 yrs.	12(29.3%)	29(70.7%)	
Number of prescription medications			
0-1	8(47.1%)	9(52.9%)	0.951
2-4	55(52.9%)	49(47.1%)	
5-7	37(49.3%)	38(50.7%)	
≥8	11(50%)	11(50%)	
Sex			
Male	29(56.9%)	22(43.1%)	0.331
Female	82(49.1%)	85(50.9%)	
Living status			
Alone	51(53.7%)	44(46.3%)	0.401
Not alone	58(47.9%)	63(52.1%)	
Marital status			
Unmarried	72(51.8%)	67(48.2%)	0.729
Married	39(49.4%)	40(50.6%)	
Comorbidity score			
≤1	11(39.3%)	17(60.7%)	0.187
>1	100(52.6%)	90(47.4%)	
Health literacy			
Marginal/limited	29(61.7%)	18(38.3%)	0.065
Good	68(46.3%)	79(53.7%)	

Table 4-16.   Continued.

Characteristics	Non-adherent (MMAS-8 <8) (n)	Adherent (MMAS-8 =8) (n)	p-Value
Healthcare decision sharing			
No	22(50%)	22(50%)	0.864
Yes	89(51.45%)	84(48.55%)	
Education			
≤High school (1-12 yrs.)	53(52.5%)	48(47.5%)	0.509
College degree (13-16 yrs.)	48(52.2%)	44(47.8%)	
Post-graduate degree (≥17 yrs.)	10(40%)	15(60%)	
Race			
Caucasians	50(42.02%)	69(57.9%)	0.021*
African Americans	52(59.8%)	35(40.2%)	
Hispanics	4(80%)	1(20%)	
Others	5(71.4%)	2(28.6%)	
Healthcare decision sharing preference			
Keep control in my own hand	12(52.2%)	11(47.8%)	0.941
Have an equal partnership	89(51.45%)	84(48.55%)	
Leave it in the doctor's hands	10(47.6%)	11(52.4%)	
Satisfaction with the antihypertensive regimen			
Dissatisfied	1(100%)	0(0%)	0.100
Not satisfied	2(100%)	0(0%)	
Somewhat satisfied	9(75%)	3(25%)	
Satisfied	35(54.7%)	29(45.3%)	
Very satisfied	62(45.3%)	75(54.7%)	

Note: (*) =$p<0.05$.

4.9   Participant Rating of Antihypertensive Medication Regimens

The hypertensive participants were asked to rate their satisfaction with each antihypertensive medication they reported taking on a 5-point Likert scale (i.e., 1-low to 5-high) in terms of their side effects, effectiveness, ease of use, cost of medication, and food interactions. Further, participants were asked to provide an overall rating of each antihypertensive medication. Then, participant-specific satisfaction with the overall antihypertensive medication regimen was calculated by taking the mean score of each rated aspect of medication use (i.e., side effects, effectiveness, etc...) for every hypertensive participant. The number of study participants who rated their antihypertensive medications was 193 participants. The participant-specific mean scores of each rated medication use aspect for the antihypertensive medication regimen across the seven senior centers are listed in **Table 4-17**.

Table 4-18 presents the correlation matrix of the rated aspects of medication use. All of the rated medication use aspects for the antihypertensive medication regimens were positively and significantly correlated with each other ($p<0.05$). Further, the instrument's internal consistency (i.e., Cronbach's alpha) was measured and found to be adequate (i.e., $\alpha=0.82$). In addition, the medication-specific average rating of the antihypertensive medications that were rated by ten or more hypertensive participants are listed in **Table 4.19**. Ten or more participants rated the following antihypertensive medications: Atenolol, Amlodipine, Hydrochlorothiazide (HCTZ), Lisinopril, Losartan, Metoprolol, and Valsartan. All of the rated antihypertensive medications had high rating scores; however, they slightly differ **(Figure 4-2)**. For example, Losartan had the highest effectiveness rating among the other rated antihypertensive medications, and Valsartan had the lowest rating **(Figure 4-3)**. Likewise, Losartan had the highest rating in terms of medication ease of use, and amlodipine had the lowest rating **(Figure 4-4)**. With regard to medication cost, Hydrochlorothiazide (HCTZ) had the highest rating, whereas, Amlodipine had the lowest rating **(Figure 4-5)**. Similarly, HCTZ had the highest rating in terms of medication food interactions, and Atenolol had the lowest rating **(Figure 4-6)**; while HCTZ had the highest rating in terms of medication side effects, and Lisinopril had the lowest rating **(Figure 4-7)**. Finally, Lisinopril had the highest overall rating, whereas, Valsartan had the lowest rating **(Figure 4-8)**.

4.10   Pearson Correlation Coefficients between Participant-Reported Outcomes (PROs)

The Pearson correlation coefficients between the Patient Reviews of Medication Experiences (PROMEX) and the Primacy Care Assessment Survey (PCAS) communication and interpersonal treatment scales, Beliefs about Medicines Questionnaire (BMQ) general harm and overuse scales, the Mental and Physical Component Summaries (MCS-12 and PCS-12) of the Short Form Health Questionnaire (SF-12v2), and the Morisky Medication Adherence Scale (MMAS-8) for hypertensive participants are listed in **Table 4-20**. PROMEX was not associated with any of the participant-reported outcomes ($p\geq0.05$). The PCAS-Communication and

Table 4-17.   Participants' evaluations of their antihypertensive medications (n=193).

Medication use aspect	Senior centers							Total (n=193)	p-Value
	Frayser-Raleigh (n=33)	Orange-Mound (n=59)	Arlington (n=21)	Bartlett (n=34)	Bert Ferguson (n=13)	McWherter (n=26)	Somerville (n=7)		
Effectiveness	4.43±0.82	4.15±1.18	4.78±0.41	4.57±0.70	4.38±0.87	4.32±0.81	4.70±0.67	4.40±0.91	0.073
Side effects	3.43±1.54	2.98±1.65	2.95±1.88	4.15±1.42	3.86±1.61	3.01±1.73	3.63±1.77	3.33±1.67	0.025*
Ease of use	4.44±1.06	4.27±1.13	4.84±0.47	4.57±0.85	4.69±0.63	4.62±0.92	4.75±0.46	4.51±0.95	0.217
Cost	4.32±1.07	3.82±1.34	4.23±1.20	4.17±1.16	4.26±1.04	4.02±1.47	3.25±1.98	4.04±1.29	0.269
Food interaction	4.09±1.39	3.81±1.48	3.82±1.56	4.15±1.39	4.03±1.32	3.69±1.74	4.00±1.41	3.93±1.47	0.880
Overall	4.49±0.83	4.27±1.01	4.77±0.40	4.59±0.88	4.69±0.63	4.46±0.86	4.71±0.49	4.49±0.86	0.255

Notes: Participants were asked to evaluate each aspect of their antihypertensive medication regimens in a scale from one to five. The higher the score, the more satisfied the participants are with their medications. (*) =$p<0.05$.

Table 4-18. Pearson correlation coefficients between the participants' rated antihypertensive medication use aspects and their p-values (n=193).

Medication use aspect	Effectiveness	Side effects	Ease of use	Cost of medication	Food interactions	Overall rating	Total correlation
Effectiveness	1.00	0.251	0.589	0.408	0.249	0.591	0.603
		0.001*	<0.001*	<0.001*	0.001*	<0.001*	
Side effects	0.251	1.00	0.290	0.363	0.564	0.349	0.405
	0.001*		<0.001*	<0.001*	<0.001*	<0.001*	
Ease of use	0.589	0.290	1.00	0.460	0.447	0.571	0.649
	<0.001*	<0.001*		<0.001*	<0.001*	<0.001*	
Cost of medication	0.408	0.363	0.460	1.00	0.514	0.498	0.610
	<0.001*	<0.001*	<0.001*		<0.001*	<0.001*	
Food interactions	0.249	0.564	0.447	0.514	1.00	0.408	0.575
	0.001*	<0.001*	<0.001*	<0.001*		<0.001*	
Overall rating	0.591	0.349	0.571	0.498	0.408	1.00	0.669
	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*		

Note: (*) =p<0.05.

Table 4-19. **Antihypertensive medication rating (medication-specific) (n=148).**

Medication name	Effectiveness		Ease of use		Cost of medication		Food interaction		Side effects		Overall	
	n	Mean± SD	n	Mean± SD	n	Mean± SD	n	Mean± SD	n	Mean± SD	n	Mean± SD
Atenolol	14	4.58±0.67	10	4.55±0.70	10	4.36±0.84	10	3.64±1.66	9	3.40±1.66	10	4.55±0.70
Amlodipine	35	4.31±0.72	34	4.41±1.08	32	3.91±1.30	33	3.88±1.52	34	2.94±1.86	32	4.50±0.76
Hydro-chlorothiazide (HCTZ)	14	4.85±0.29	12	4.92±0.29	12	4.92±0.29	12	4.85±0.39	12	4.08±1.15	12	4.77±0.39
Lisinopril	35	4.56±0.84	28	4.77±0.65	28	4.27±1.12	28	3.93±1.52	29	2.81±1.80	27	4.79±0.40
Losartan	14	5.00±0.00	13	5.00±0.00	13	4.50±1.33	12	4.15±1.68	13	3.86±1.79	13	4.71±1.11
Metoprolol	26	4.76±0.45	24	4.69±0.87	23	4.32±0.99	22	3.83±1.69	23	3.44±1.78	23	4.44±0.99
Valsartan	10	4.11±0.82	10	4.88±0.41	10	4.56±0.76	10	4.14±1.74	10	3.14±1.99	10	4.38±0.82
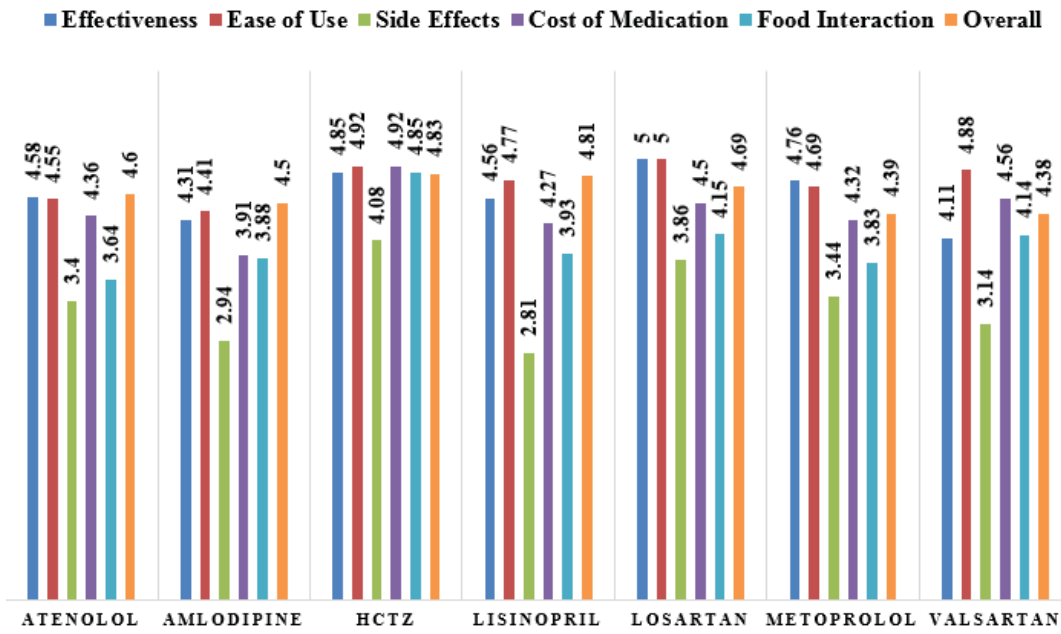
Figure 4-2. Antihypertensive medication ratings.
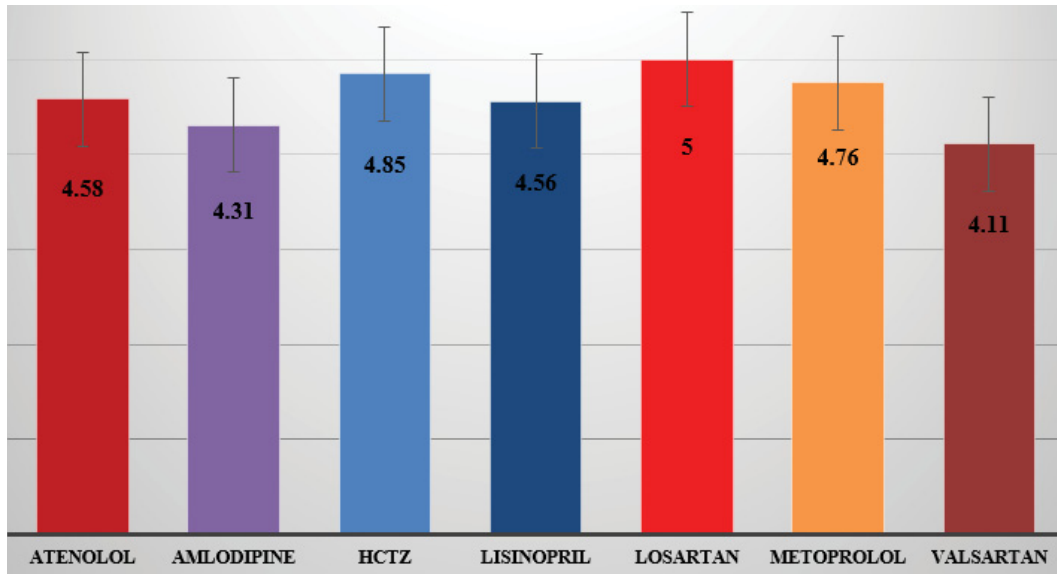
Figure 4-3. **Rating of antihypertensive medications' effectiveness.**
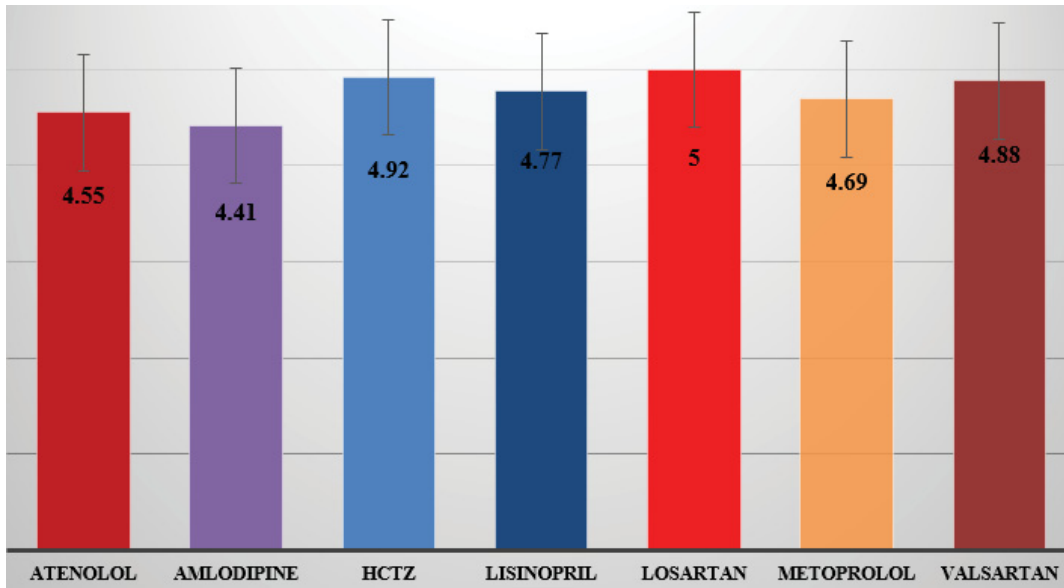
Figure 4-4. Rating of antihypertensive medications' ease of use.
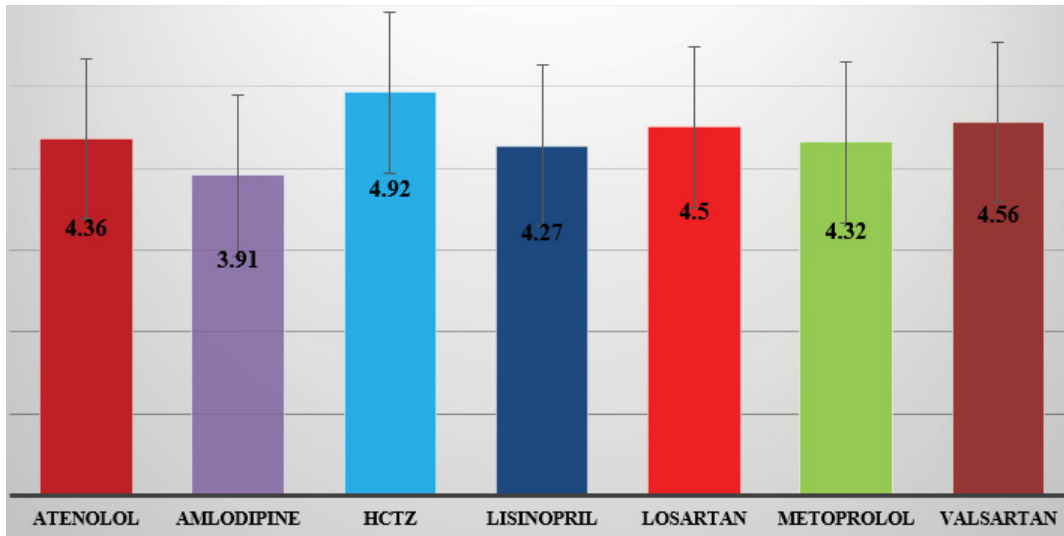
Figure 4-5. **Rating of antihypertensive medications' cost.**
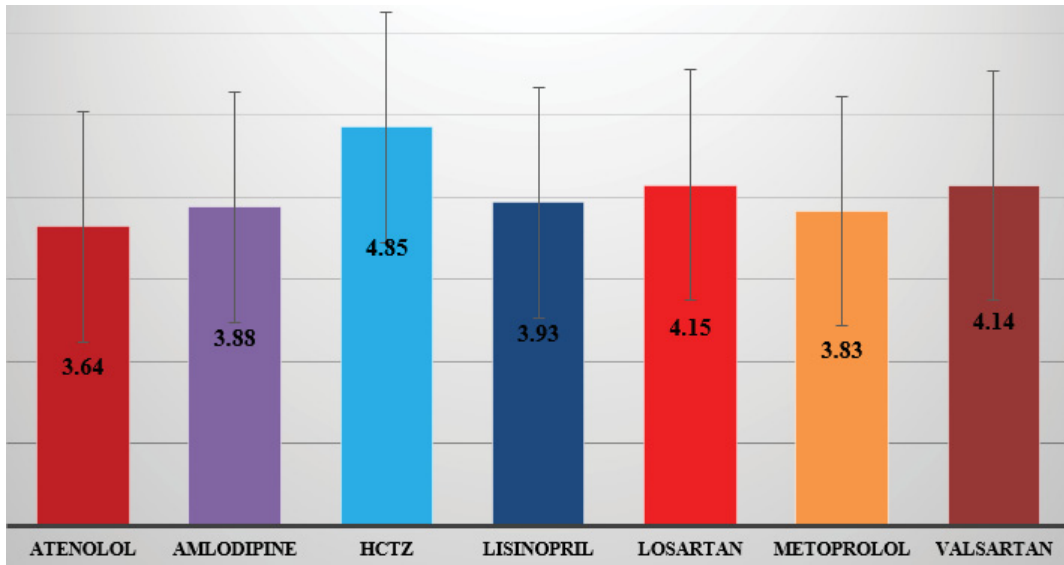
Figure 4-6.   **Rating of antihypertensive medications' food interactions.**
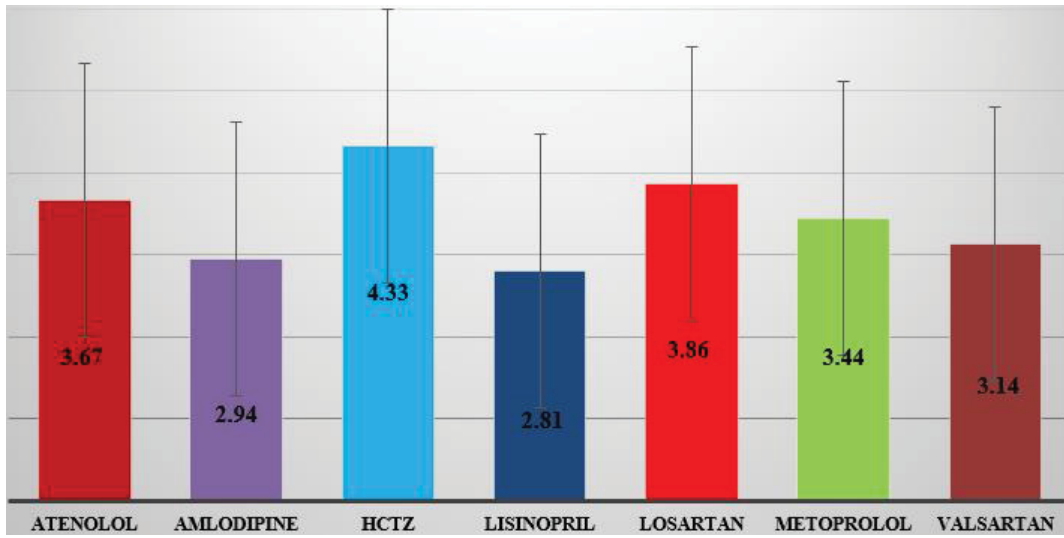
Figure 4-7. **Rating of antihypertensive medications' side effects.**
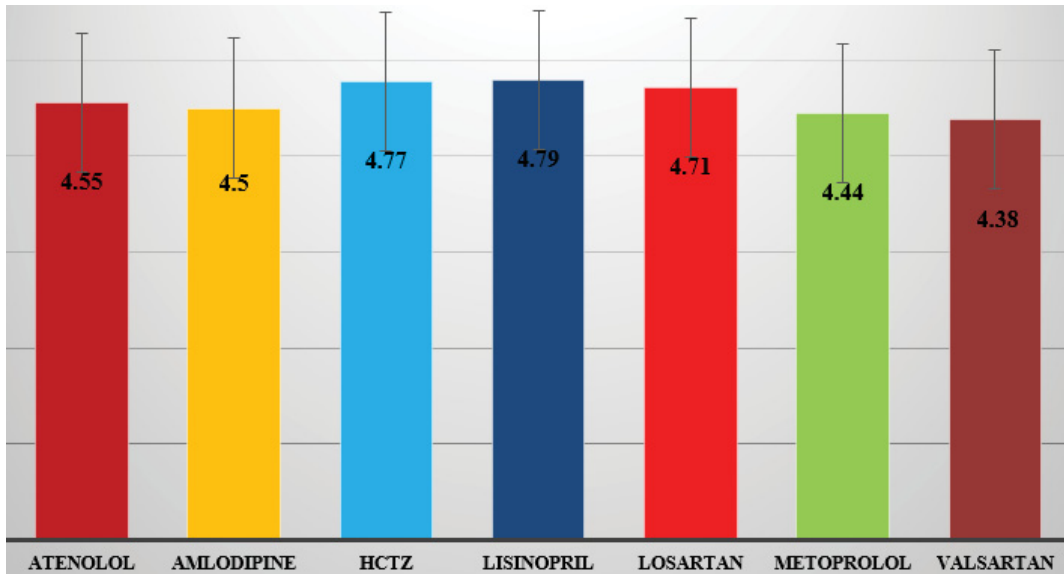
Figure 4-8.   Overall rating of antihypertensive medications.

Table 4-20. Pearson correlation coefficients between the participant-reported outcomes (PROs) and their p-values (n=298).

PRO variable	PROMEX	PCAS-Communication	PCAS-Interpersonal	MCS-12	PCS-12	BMQ-Overuse	BMQ-Harm	MMAS-8
PROMEX	1.00	0.048	0.030	−0.110	−0.106	−0.080	−0.042	−0.066
		0.407	0.604	0.055	0.066	0.168	0.470	0.327
PCAS-Communication	0.048	1.00	0.872	0.161	0.134	−0.164	−0.231	0.204
	0.407		<0.001*	0.005*	0.020*	0.004*	<0.001*	0.002*
PCAS-Interpersonal	0.030	0.872	1.00	0.148	0.100	−0.155	−0.209	0.193
	0.604	<0.001*		0.010*	0.082	0.007*	0.001*	0.004*
MCS-12	−0.110	0.161	0.148	1.00	−0.056	0.056	−0.142	0.180
	0.055*	0.005*	0.010*		0.328	0.335	0.014*	0.007*
PCS-12	−0.106	0.134	0.100	−0.056	1.00	0.086	0.041	0.120
	0.066	0.020*	0.082	0.328		0.135	0.471	0.076
BMQ-Overuse	−0.080	−0.164	−0.155	0.056	0.086	1.00	0.460	−0.108
	0.168	0.004*	0.007*	0.335	0.135		<0.001	0.112
BMQ-Harm	−0.042	−0.231	−0.209	−0.142	0.041	0.460	1.00	−0.089
	0.470	<0.001*	0.001*	0.014*	0.471	<0.001*		0.190
MMAS-8	−0.066	0.204	0.193	0.180	0.120	−0.108	−0.089	1.00
	0.327	0.002*	0.004*	0.007*	0.076	0.112	0.190	

Note: (*) =p<0.05.

PCAS-interpersonal treatment were associated with each other (r=0.872; p<0.001). Further, the PCAS-Communication was associated with both the MCS-12 (r=0.162; p=0.005) and PCS-12 (r=0.134; p=0.020) of the SF-12v2. In addition, the PCAS-Communication was associated with both the BMQ-overuse (r= −0.164; p=0.004) and BMQ-Harm (r=−0.231; p<0.001). Moreover, the PCAS-Communication was associated with MMAS-8 (r=0.204; p=0.002). Likewise, the PCAS-Interpersonal treatment was associated the MCS-12 (r=0.148; p=0.010) but not with the PCS-12 (p≥0.05). Further, the PCAS-interpersonal treatment was associated with both the BMQ-overuse (r=−0.155; p=0.007) and BMQ-Harm (r=−0.209; p=0.001). In addition, the PCAS-interpersonal treatment was associated with the MMAS-8 (r=0.193; p=0.004). The MCS-12 was associated with BMQ-Harm (r=−0.142; p=0.014) and with the MMAS-8 (r=0.180; p=0.007). Finally, the BMQ-overuse and BMQ-Harm were associated with each other (r=0.460; p<0.001).

4.11 Pearson Correlation Coefficients between the Participant-Specific Ratings of Antihypertensive Medication Regimens and PROs

The correlation coefficients between participant-specific ratings of antihypertensive medication regimens and participant-reported outcomes are listed in **Table 4-21**. The participant-specific rating of antihypertensive medication regimen effectiveness was associated with both the PCAS-Communication (r=0.192; p=0.006) and interpersonal treatment (r=0.189; p=0.007) scales. Further, the participant-specific rating of antihypertensive medication regimen effectiveness was associated with the PCS-12 (r=0.178; p=0.012). Likewise, the participant-specific antihypertensive medication regimen ease of use rating was associated with the PCAS-Communication (r=0.157; p=0.030). The participant-specific antihypertensive medication regimen cost, side effects, and food interactions ratings were not associated with any of the measured participant-reported outcomes (p≥0.05). Finally, the participant-specific overall antihypertensive medication regimen rating was associated with PCAS-Communication (r=0.280; p=0.001), PCAS-interpersonal treatment (r=0.223; p=0.002), and the BMQ-Harm (r=−0.184; p=0.012) scales.

4.12 Older Adult Participants' Views of Online Medication Rating Websites and Their Satisfaction with Physician Communication

4.12.1 Path Model for the Association between PROMEX and PCAS-Communication

A path model was built to examine the association between participants' satisfaction with physician communication and their views of online medication rating websites. The PCAS-Communication scale was used to assess participant satisfaction with physician communication, whereas, PROMEX was used to assess participant views of online medication rating websites. Education, gender, age, health literacy, race, marital status, and comorbidities were treated as exogenous variables that influence the

Table 4-21. Pearson correlation coefficients between the participant-specific rating of antihypertensive medication regimens and participant-reported outcomes (PROs) variables.

Medication use aspect	PROMEX	PCAS-Communication	PCAS-Interpersonal	MCS-12	PCS-12	BMQ-Overuse	BMQ-Harm	MMAS-8
Effectiveness	−0.010	0.192	0.189	0.096	0.178	−0.082	−0.133	0.131
	0.887	0.006*	0.007*	0.180	0.012*	0.250	0.062	0.066
Side effects	−0.070	−0.073	−0.052	−0.021	0.085	0.036	−0.052	0.024
	0.337	0.315	0.475	0.771	0.245	0.622	0.475	0.742
Ease of use	0.005	0.157	0.138	0.044	0.094	−0.073	−0.122	0.115
	0.944	0.030*	0.055	0.545	0.195	0.314	0.093	0.111
Cost	0.036	0.108	0.116	−0.059	0.106	−0.075	−0.129	0.094
	0.617	0.139	0.112	0.421	0.146	0.308	0.078	0.198
Food interaction	−0.002	0.071	0.096	−0.062	0.074	0.005	−0.092	−0.045
	0.975	0.339	0.197	0.408	0.324	0.946	0.217	0.544
Overall	−0.089	0.280	0.223	0.134	0.124	−0.128	−0.184	0.107
	0.229	0.001*	0.002*	0.069	0.095	0.082	0.012*	0.148

Note: (*) = $p < 0.05$.

participant satisfaction with physician communication (i.e., PCAS-Communication). The PCAS-Communication was treated as both an endogenous variable in which it is influenced by the exogenous variables, as well as an exogenous variable in which it influences participant views of online medication rating websites (i.e., PROMEX). The results of the path analysis are presented in **Figure 4-9** and **Table 4-22**. Participant views of online medication rating websites (i.e., PROMEX) were not influenced by participant satisfaction with physician communication (i.e., PCAS-Communication) ($p \geq 0.05$). Further, their views were not influenced by other exogenous variables (i.e., age, race, education, etc.) ($p \geq 0.05$). However, participant satisfaction with physician communication (i.e., PCAS-Communication) was positively influenced by marital status ($\beta=0.119$; $p=0.049$), health literacy ($\beta=0.18$; $p=0.002$), and gender ($\beta=0.123$; $p=0.038$), and negatively influenced by race ($\beta=-0.14$; $p=0.019$). An analysis of the fit indices indicated adequate model fit (comparative fit index=1.00, adjusted goodness of fit index=0.99, root mean square error of approximation= 0.00, and standardized root mean square residual=0.020).

4.12.2 Multiple Linear Regression for the Association between PROMEX and PCAS-Communication

In addition to the path analysis, a multiple linear regression analysis was completed to examine the association between PROMEX and the PCAS-Communication controlling for the same sociodemographic factors in the path model as well as comorbidities. As with the path analysis, no significant association was found between PROMEX and PCAS-Communication ($p \geq 0.05$) **(Table 4-23)**.

4.13 Older Adult Participants' Satisfaction with Physician Communication and Overall Rating of Their Antihypertensive Medication Regimens

The results of the multiple linear regression analysis that examined the association between the Primary Care Assessment Survey communication scale (PCAS-Communication) and participants' overall rating of their antihypertensive medication regimens are listed in **Table 4-24**. The higher the overall rating of antihypertensive medication regimen score, the higher the score of the PCAS-Communication ($\beta=5.031$; $p=0.005$). Hypertensive participants with high overall rating of their antihypertensive medication regimens were more likely to have high PCAS-Communication score compared to participants with low overall rating of their antihypertensive medication regimens controlling for their age, comorbidities, race, education, and gender, marital status, number of prescription medications, and health literacy level. Health literacy also influenced the satisfaction with physician communication; participants with good health literacy level were more likely to have higher PCAS-Communication scores ($\beta=9.965$; $p=0.007$). Age, comorbidities, race, education, gender, number of prescription medications, and marital status were not associated with the PCAS-Communication ($p \geq 0.05$).

Figure 4-9.   Path analysis: Association between PROMEX and PCAS-Communication.

Table 4-22.   Path analysis: Standardized direct, indirect, and total effects of the variables evaluated on PROMEX and PCAS-Communication (n=286).

Outcome variables	R^2	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
Patient Reviews of Medication Experiences (PROMEX)	0.002	PCAS-Communication	0.045	0.00	0.045	0.465
		Age	0.00	−0.002	−0.002	0.606
		Education	0.00	0.001	0.001	0.727
		Marital status	0.00	0.005	0.005	0.494
		Health literacy	0.00	0.008	0.008	0.478
		Comorbidities	0.00	−0.002	−0.002	0.546
		Race	0.00	−0.006	−0.006	0.486
		Gender	0.00	0.005	0.005	0.491
PCAS-Communication	0.11	Age	−0.04	0.00	−0.04	0.466
		Education	0.024	0.00	0.024	0.692
		Marital status	0.119	0.00	0.119	0.049*
		Health literacy	0.181	0.00	0.181	0.002*
		Comorbidities	−0.06	0.00	−0.06	0.283
		Race	−0.14	0.00	−0.14	0.019*
		Gender	0.123	0.00	0.123	0.038*

Notes: R-Square= 0.01. (*)=p<0.05.

Table 4-23.   Multiple linear regression: The association between PROMEX and PCAS-Communication (n=286).

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
PCAS-Communication	0.023	0.230	−0.01	0.062
Age	0.001	0.973	−0.08	0.084
Comorbidity score	0.215	0.164	−0.08	0.520
Education	−0.02	0.831	−0.29	0.235
Race	0.747	0.167	−0.31	1.810
Health literacy	−0.06	0.937	−1.57	1.458
Gender	−0.89	0.276	−2.49	0.718
Marital status	0.083	0.906	−1.31	1.486

Notes: R-Square= 0.02. (*)=p<0.05.

Table 4-24.   Multiple linear regression: The association between hypertensive participants' PCAS-Communication scale scores and overall ratings of their antihypertensive medication regimens (n=193).

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
Overall rating of HTN medications	5.031	0.005*	1.513	8.550
Age	−0.026	0.884	−0.391	0.337
Comorbidity score	0.318	0.695	−1.290	1.928
Education	0.582	0.340	−0.621	1.787
Race	−1.490	0.523	−6.094	3.113
Health literacy	9.965	0.007*	2.648	17.282
Gender	3.285	0.358	−3.755	10.325
Number of prescription medications	−0.662	0.343	−2.039	0.714
Marital status	3.012	0.344	−3.263	9.287

Notes: R-Square= 0.17. (*)=p<0.05.

4.14   Older Adults' Views of Online Medication Rating Websites and Their Quality of Life

4.14.1 Path Model for the Association between PROMEX and MCS-12

The results of the path model that tested the association between participants' views of online medication rating websites (i.e., PROMEX) and their mental health quality of life (MCS-12) are presented in **Figure 4-10** and **Table 4-25.** The participants' views of online medication rating websites (i.e., PROMEX) were not influenced by their mental health quality of life (i.e., MCS-12) ($p \geq 0.05$). Further, their views were not influenced by other exogenous variables (i.e., age, race, education…etc.) ($p \geq 0.05$). However, the older adults' mental health quality of life (MCS-12) was positively influenced by their age ($\beta=0.219$; $p=0.001$), education ($\beta=0.144$; $p=0.014$), and health literacy ($\beta=0.243$; $p=<0.001$), and negatively influenced by their comorbidities ($\beta=-0.178$; $p=0.001$). An analysis of the fit indices indicated adequate model fit (comparative fit index=1.00, adjusted goodness of fit index=0.99, root mean square error of approximation= 0.00, and standardized root mean square residual=0.015).

4.14.2 Path Model for the Association between PROMEX and PCS-12

The results of the path model that tested the association between participants' views of online medication rating websites (i.e., PROMEX) and their physical health quality of life (PCS-12) are presented in **Figure 4-11** and **Table 4-26.** The participants' views of online medication rating websites (i.e., PROMEX) were significantly influenced by their physical health quality of life (i.e., PCS-12) ($\beta=-0.126$; $p=0.040$). Participants with low PCS-12 scores were more likely to have favorable views of online medication rating websites. However, their views were not influenced by other exogenous variables (i.e., age, race, education…etc.) ($p \geq 0.05$). The participants' physical health quality of life (PCS-12) was positively influenced by their satisfaction with physician communication (i.e., PCAS-Communication) ($\beta=0.125$; $p=0.035$). However, it was negatively influenced by their age ($\beta=-0.120$; $p=0.048$) and comorbidities ($\beta=-0.360$; $p<0.001$). An analysis of the fit indices indicated adequate model fit (comparative fit index=1.00, adjusted goodness of fit index=0.99, root mean square error of approximation= 0.00, and standardized root mean square residual=0.015).

4.14.3 Multiple Linear Regression for the Association between PROMEX and Both PCS-12 and MCS-12

In addition to the path analyses, we did multiple linear regression analyses to examine the association between PROMEX and the quality of life scales (i.e., PCS-12 and MCS-12) controlling for the same variables in the path analyses. In the first regression model, we examined the association between the mental quality of life (i.e., MCS-12) and participants' views of online medication rating websites (i.e., PROMEX). As with the
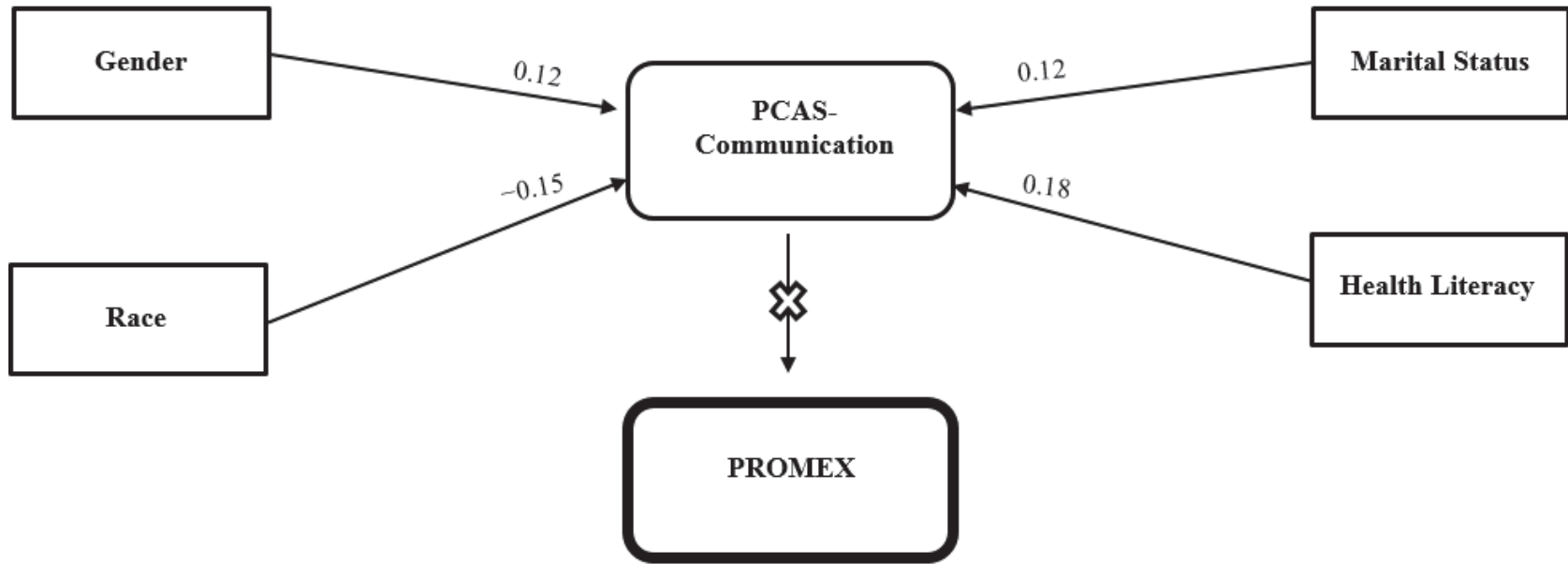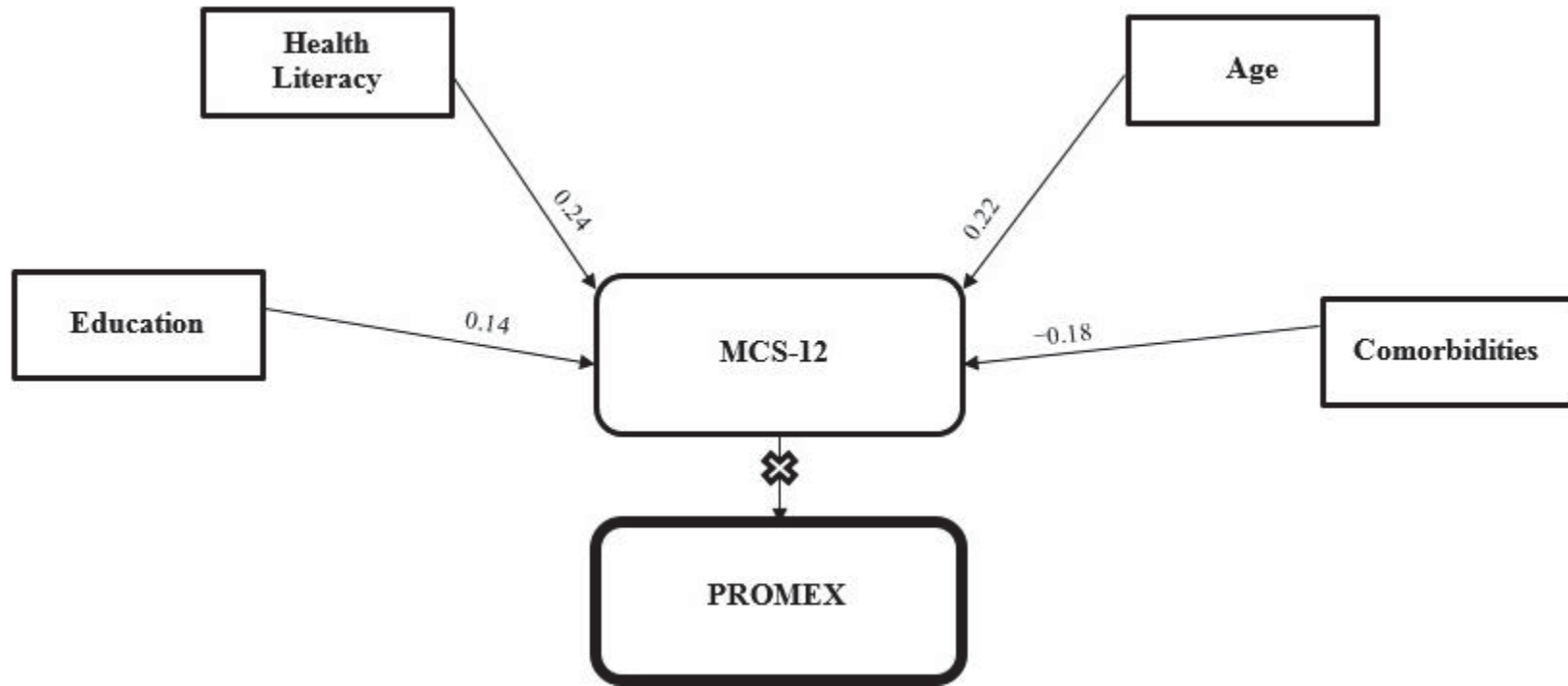
Figure 4-10.   Path analysis: The association between PROMEX and MCS-12.

Table 4-25. Path analysis: Standardized direct, indirect, and total effects of the variables evaluated on PROMEX and MCS-12 (n=286).

Outcome variables	R²	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
Patient Reviews of Medication Experiences (PROMEX)	0.012	MCS-12	−0.111	0.00	−0.111	0.071
		PCAS-Interpersonal Treatment	0.00	−0.01	−0.01	0.188
		Age	0.00	−0.024	−0.024	0.107
		Education	0.00	−0.016	−0.016	0.147
		Marital status	0.00	−0.011	−0.011	0.209
		Health literacy	0.00	−0.027	0.099	0.099
		Comorbidities	0.00	0.019	0.019	0.118
		Race	0.00	−0.004	−0.004	0.561
		Gender	0.00	−0.012	−0.012	0.194
MCS-12	0.189	PCAS-Interpersonal Treatment	0.11	0.00	0.111	0.052
		Age	0.219	0.00	0.219	0.001*
		Education	0.144	0.00	0.144	0.014*
		Marital status	0.103	0.00	0.103	0.078
		Health literacy	0.243	0.00	0.243	<0.001*
		Comorbidities	−0.178	0.00	−0.178	0.001*
		Race	0.037	0.00	0.037	0.539
		Gender	0.108	0.00	0.108	0.060

Notes: R-Square= 0.01. (*)=p<0.05.
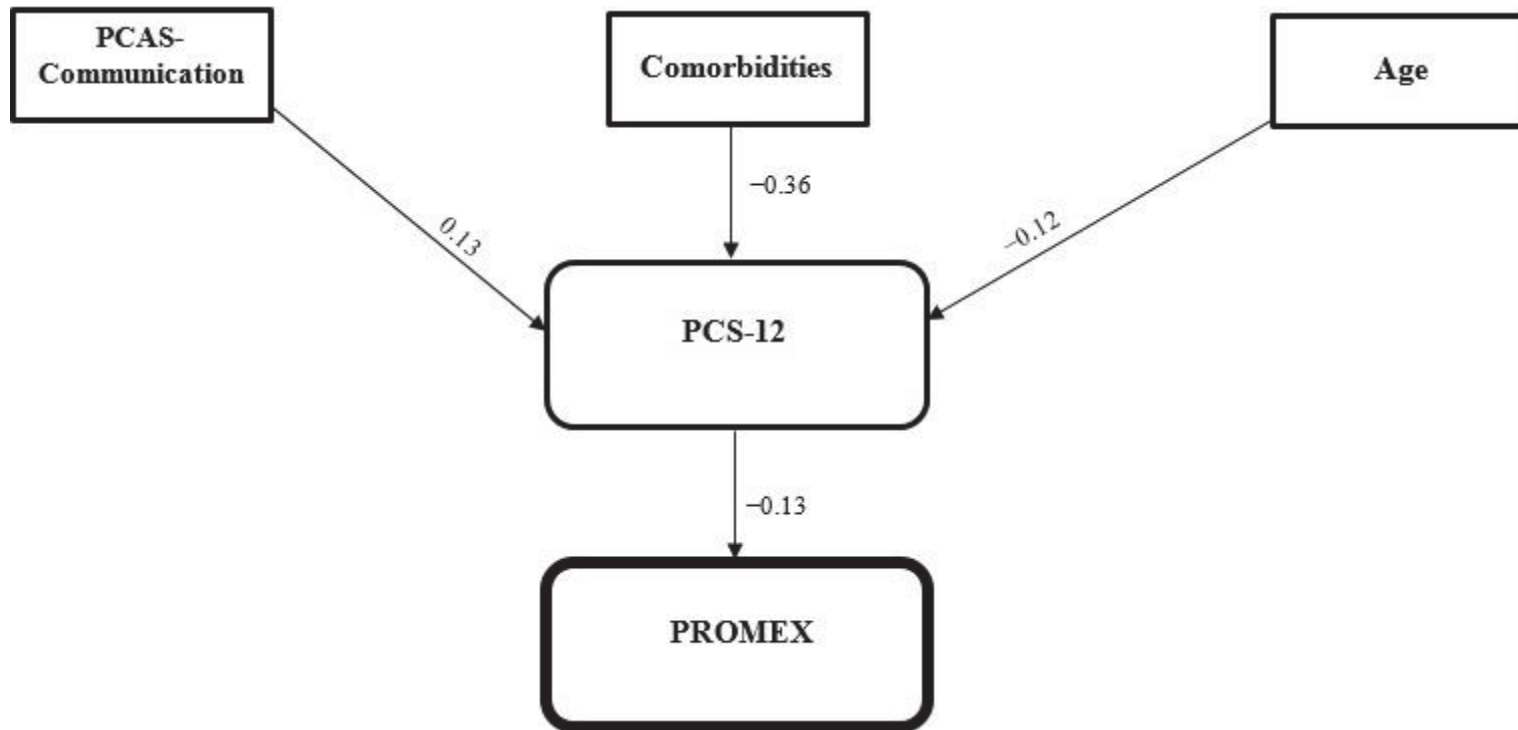
Figure 4-11.   Path analysis: The association between PROMEX and PCS-12.

Table 4-26.   Path analysis: Standardized direct, indirect, and total effects of the variables evaluated on PROMEX and PCS-12 (n=286).

Outcome variables	R^2	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
Patient Reviews of Medication Experiences (PROMEX)	0.016	PCS-12	−0.126	0.00	−0.126	0.040*
		PCAS-Communication	0.00	−0.015	−0.015	0.142
		Age	0.00	0.015	0.015	0.156
		Education	0.00	−0.001	−0.001	0.939
		Marital Status	0.00	0.013	0.013	0.167
		Health Literacy	0.00	−0.001	−0.001	0.977
		Comorbidities	0.00	0.045	0.045	0.051
		Race	0.00	0.007	0.007	0.369
		Gender	0.00	0.002	0.002	0.786
PCS-12	0.174	PCAS-Communication	0.125	0.00	0.125	0.035*
		Age	−0.120	0.00	−0.120	0.048*
		Education	0.004	0.00	0.004	0.939
		Marital Status	−0.110	0.00	−0.110	0.061
		Health Literacy	0.001	0.00	0.001	0.977
		Comorbidities	−0.360	0.00	−0.360	<0.001*
		Race	−0.061	0.00	−0.061	0.317
		Gender	−0.015	0.00	−0.015	0.784

Notes: R-Square=0.01. (*)=p<0.05.

path analysis, the MCS-12 did not influence PROMEX (p≥0.05) **(Table 4-27)**. In the second regression model, we examined the association between the physical quality of life (i.e., PCS-12) and participants' views of online medication rating websites (i.e., PROMEX). Contrary to the path analysis, the PCS-12 did not influence PROMEX (p≥0.05) **(Table 4-28)**. In the third regression model, we included both the PCS-12 and the MCS-12 to examine the effects of both HRQoL measures on participants' views of online medication rating websites; however, no significant association was found between either PCS-12 or MCS-12 and PROMEX (p≥0.05) **(Table 4-29)**.

4.15   The Health-Related Quality of Life and the Overall Rating of Antihypertensive Regimens

4.15.1 The Association between the MCS-12 and the Overall Rating of Antihypertensive Regimens

The results of the multiple regression analysis that examined the association between the MCS-12 and the overall rating of antihypertensive medication regimens are presented in **Table 4-30**. The participants' overall rating of antihypertensive medication regimens did not influence their mental health quality of life (i.e. MCS-12) (p≥0.05). However, age and health literacy were positively associated the MCS-12, and participants' comorbidities was negatively associated with MCS-12 (p<0.05).

4.15.2 The Association between the PCS-12 and the Overall Rating of Antihypertensive Regimens

The results of the multiple regression analysis that examined the association between the PCS-12 and the overall rating of antihypertensive medication regimens are presented in **Table 4-31**. The participants' overall rating of antihypertensive medication regimens significantly influenced their physical health quality of life (i.e., PCS-12) (β=2.740; p=0.005). The higher the overall rating of antihypertensive medication regimens, the more likely participants will have high PCS-12 scores controlling for their age, comorbidities, race, education, and gender, marital status, number of prescription medications, and health literacy level. Further, comorbidities also influenced participants' physical health quality of life (i.e., PCS-12) (β=−1.202; p=0.008). The more diseases participants have, the more likely they will have lower PCS-12 scores.

Table 4-27.   Multiple linear regression: The association between PROMEX and HRQoL (MCS-12) (n=286).

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
MCS-12	−0.057	0.127	−0.130	0.016
PCAS-Communication	0.025	0.189	−0.012	0.064
Age	0.015	0.714	−0.069	0.100
Comorbidity score	0.170	0.277	−0.138	0.480
Education	0.003	0.980	−0.262	0.269
Race	0.776	0.150	−0.284	1.837
Health literacy	0.229	0.772	−1.330	1.790
Gender	−0.741	0.366	−2.358	0.874
Marital status	0.206	0.773	−1.201	1.614

Note: R-Square= 0.03.

Table 4-28. Multiple linear regression: The association between PROMEX and HRQoL (PCS-12) (n=286).

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
PCS-12	−0.059	0.089	−0.129	0.009
PCAS-Communication	0.028	0.157	−0.010	0.067
Age	−0.007	0.861	−0.090	0.076
Comorbidity score	0.112	0.497	−0.213	0.438
Education	−0.027	0.837	−0.289	0.235
Race	0.690	0.200	−0.370	1.751
Health literacy	−0.058	0.939	−1.571	1.455
Gender	−0.914	0.262	−2.517	0.689
Marital status	−0.057	0.935	−1.464	1.349

Note: R-Square=0.03.

Table 4-29.   Multiple linear regression: The association between PROMEX and HRQoL (PCS-12 and MCS-12) (n=286).

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
PCS-12	−0.067	0.056	−0.137	0.001
MCS-12	−0.065	0.079	−0.139	0.007
PCAS-Communication	0.031	0.115	−0.007	0.070
Age	0.008	0.850	−0.076	0.092
Comorbidity score	0.047	0.777	−0.284	0.380
Education	0.009	0.944	−0.255	0.274
Race	0.716	0.183	−0.340	1.773
Health literacy	0.277	0.725	−1.275	1.830
Gender	−0.745	0.361	−2.353	0.862
Marital status	0.066	0.926	−1.341	1.473

Note: R-Square= 0.04.

Table 4-30. Multiple linear regression: The association between hypertensive participants' MCS-12 scores and overall ratings of their antihypertensive medication regimens (n=193).

Variable	Beta (β) estimate	p-Value	95% Confidence limits Lower	Upper
Overall rating of HTN medications	0.410	0.636	−1.300	2.120
Age	0.329	0.001*	0.152	0.507
Comorbidity score	−1.299	0.001*	−2.082	−0.515
Education	0.375	0.210	−0.213	0.965
Race	1.191	0.295	−1.051	3.434
Health literacy	5.230	0.004*	1.672	8.788
Gender	2.193	0.207	−1.228	5.616
Number of prescription medications	0.591	0.082	−0.077	1.260
Marital status	1.402	0.365	−1.650	4.454

Notes: R-Square: 0.20. (*)=p<0.05.

Table 4-31. **Multiple linear regression: The association between hypertensive participants' PCS-12 scores and overall ratings of their antihypertensive medication regimens (n=193).**

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
Overall rating of HTN medications	2.740	0.005*	0.809	4.672
Age	−0.071	0.481	−0.271	0.128
Comorbidity score	−1.202	0.008*	−2.087	−0.318
Education	0.064	0.848	−0.600	0.730
Race	−2.123	0.099	−4.655	0.409
Health literacy	−3.972	0.052	−7.989	0.044
Gender	−0.558	0.775	−4.422	3.305
Number of prescription medications	−0.540	0.159	−1.296	0.214
Marital status	−0.598	0.731	−4.044	2.846

Notes: R-Square=0.15. (*)=p<0.05.

4.16 Older Adult Participants' Views of Online Medication Rating Websites and Their Beliefs about Medications

4.16.1 Path Model for the Association between PROMEX and BMQ-Overuse Scale

The results of the path analysis that examined the association between participants' views of online medication rating websites and BMQ-overuse are presented in **Figure 4-12** and **Table 4-32**. The participants' views of online medication rating websites (i.e., PROMEX), were not influenced by the beliefs that medications are generally overused or overprescribed (i.e., BMQ-overuse) ($p \geq 0.05$). Further, PROMEX was not influenced by the other exogenous variables (i.e., age, gender, education, etc.). However, BMQ-overuse was negatively influenced by PCAS-Communication ($\beta=-0.194$; $p=0.001$), and the number of prescription medications taken ($\beta=-0.202$; $p=0.001$), and positively influenced by gender ($\beta=0.175$, $p=0.001$). Participants who were satisfied with their physician communication were less likely to believe that medications are overused or overprescribed. Further, the higher the number of prescription medications taken by participants, the less likely they believe medications are overprescribed or overused. On the other hand, women were more likely than men to believe that medications are overprescribed or overused. An analysis of the fit indices indicated adequate model fit (comparative fit index=1.00, adjusted goodness of fit index=0.999, root mean square error of approximation= 0.00, and standardized root mean square residual=0.017).

4.16.2 Path Model for the Association between PROMEX and BMQ-Harm Scale

The results of the path analysis that examined the association between participants' views of online medication rating websites and BMQ-Harm are presented in **Figure 4-13** and **Table 4-33**. The participants' views of online medication rating websites (i.e., PROMEX), were not influenced by the beliefs that medications are inherently harmful (i.e., BMQ-overuse) ($p \geq 0.05$). Further, PROMEX was not influenced by the other exogenous variables (i.e., age, gender, education, etc.). However, the BMQ-Harm was negatively influenced by the PCAS-Communication ($\beta=-0.221$; $p<0.001$), age ($\beta=-0.177$; $p=0.002$), education ($\beta=-0.124$; $p=0.030$), and number of prescription medications taken ($\beta=-0.185$; $p=0.001$). Participants who were satisfied with their physician communication were less likely to believe that medications are harmful. Further, the older the participants, the less likely they believe that medications are harmful. In addition, participants with higher levels of education were less likely to believe medications are harmful. Moreover, the higher the number of prescription medications taken by participants, the less likely they believe medications are harmful. An analysis of the fit indices indicated adequate model fit (comparative fit index=0.993, adjusted goodness of fit index=0.999, root mean square error of approximation=0.01, and standardized root mean square residual=0.021).
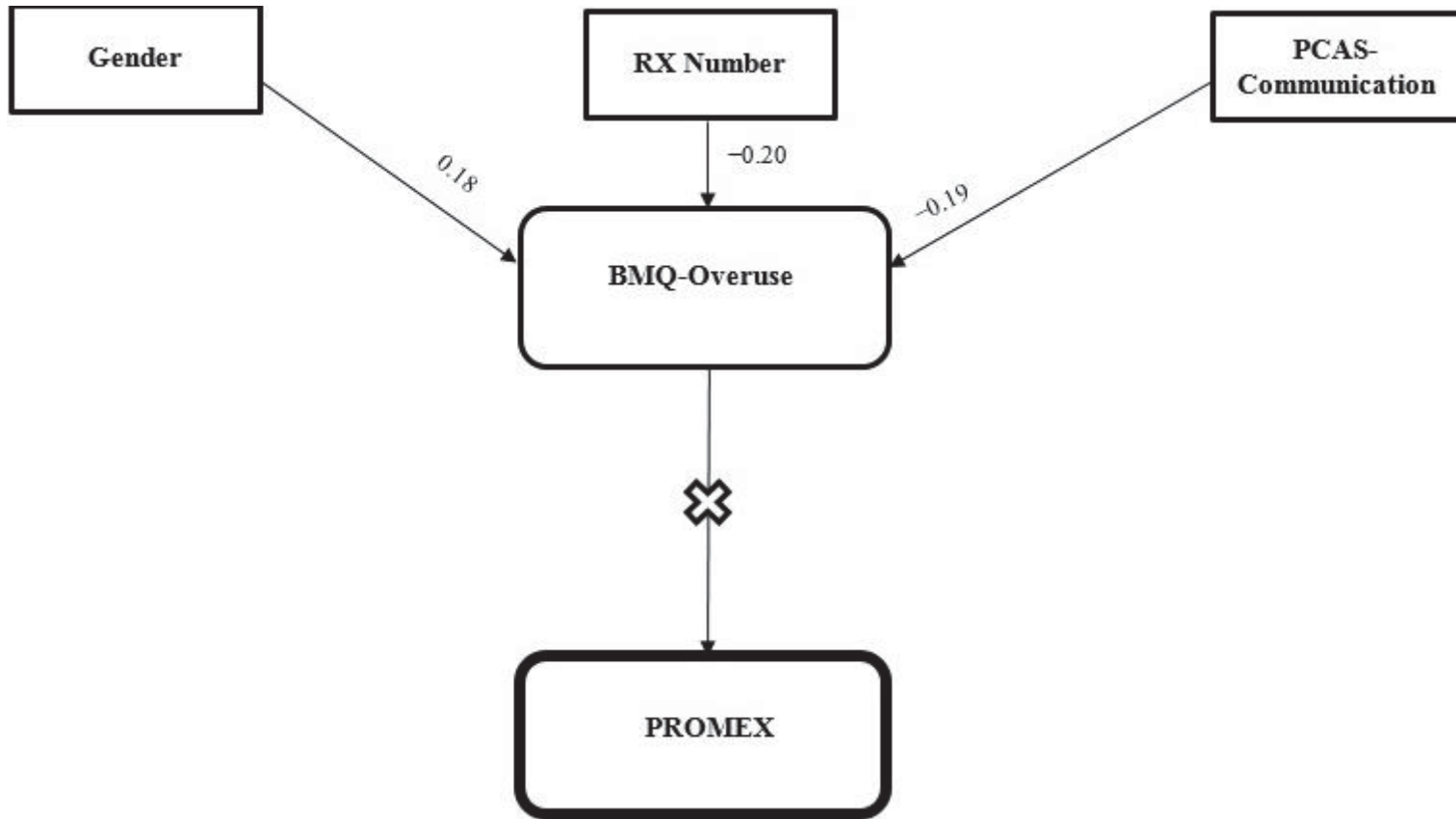
Figure 4-12. Path analysis: The association between PROMEX and BMQ-Overuse.

Table 4-32.   Path analysis: Standardized direct, indirect, and total effects of the variables evaluated on PROMEX and BMQ-Overuse (n=286).

Outcome variables	R²	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
Patient Reviews of Medication Experiences (PROMEX)	0.005	BMQ-Overuse	−0.070	0.00	−0.070	0.236
		PCAS-Communication	0.00	0.013	0.013	0.264
		Age	0.00	0.002	0.002	0.606
		Education	0.00	−0.00	−0.00	0.426
		Number of prescription medications	0.00	0.014	0.014	0.261
		Race	0.00	0.004	0.004	0.447
		Gender	0.00	−0.01	−0.01	0.269
BMQ-Overuse	0.111	PCAS-Communication	−0.194	0.00	−0.194	0.001*
		Age	−0.034	0.00	−0.034	0.567
		Education	0.063	0.00	0.063	0.282
		Number of prescription medications	−0.202	0.00	−0.202	0.001*
		Race	−0.059	0.00	−0.059	0.321
		Gender	0.175	0.00	0.175	0.001*

Notes: R-Square=0.01. (*)=p<0.05.
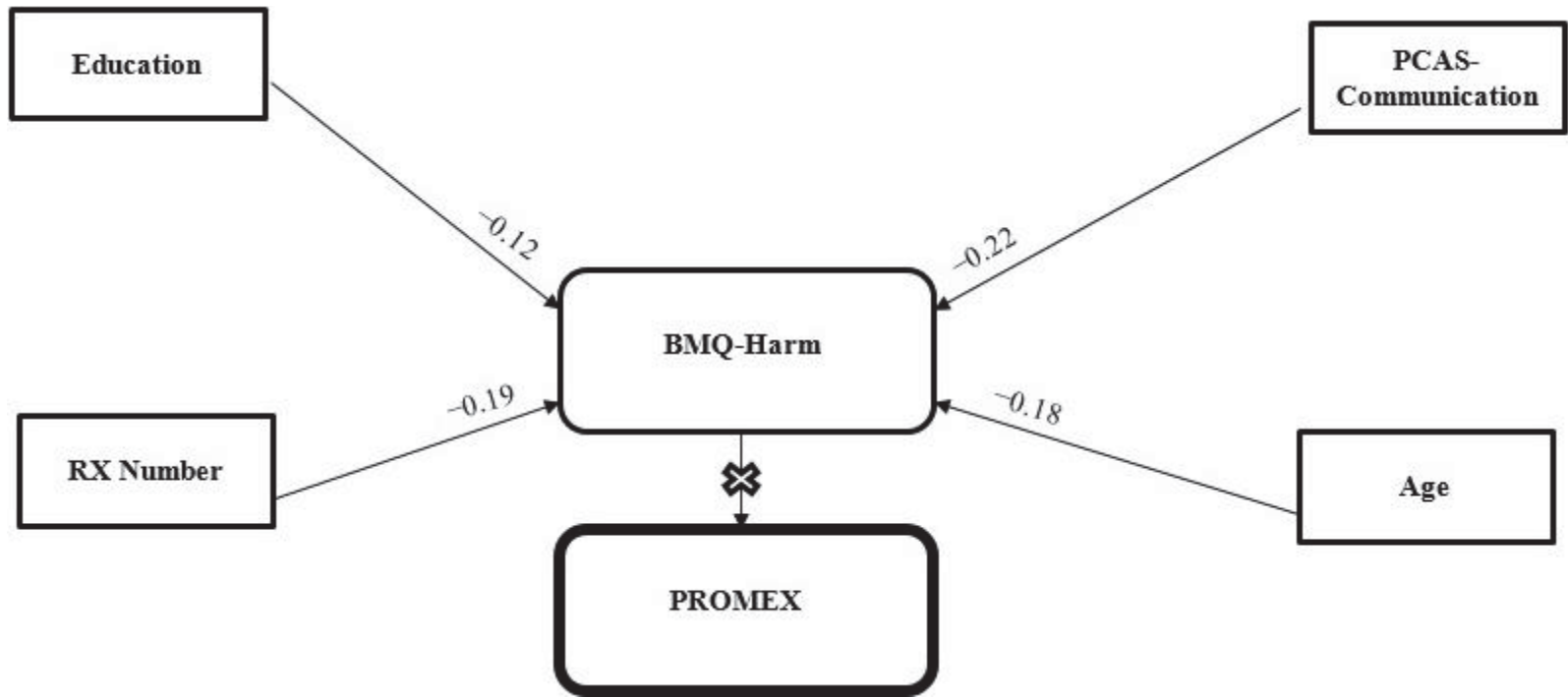
Figure 4-13.   Path analysis: The association between PROMEX and BMQ-Harm.

Table 4-33. Path analysis: Standardized direct, indirect, and total effects of the variables evaluated on PROMEX and BMQ-Harm (n=286).

Outcome variables	R^2	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
Patient Reviews of Medication Experiences (PROMEX)	0.003	BMQ-Harm	−0.052	0.00	−0.052	0.379
		PCAS-Communication	0.00	0.011	0.011	0.391
		Age	0.00	0.009	0.009	0.398
		Education	0.00	0.006	0.006	0.415
		Number of prescription medications	0.00	0.009	0.009	0.395
		Race	0.00	−0.001	−0.001	0.667
		Gender	0.00	−0.003	−0.003	0.471
BMQ-Harm	0.140	PCAS-Communication	−0.221	0.00	−0.221	<0.001*
		Age	−0.177	0.00	−0.177	0.002*
		Education level	−0.124	0.00	−0.124	0.030*
		Number of prescription medications	−0.185	0.00	−0.185	0.001*
		Race	0.028	0.00	0.028	0.623
		Gender	0.070	0.00	0.070	0.208

Notes: R-Square= 0.01. (*)=p<0.05.

4.16.3 Multiple Linear Regression for the Association between PROMEX and Both BMQ-Overuse and BMQ-Harm

In addition to the path analyses, a multiple linear regression analysis was performed to examine the association between PROMEX and beliefs about medications (i.e., BMQ-overuse & BMQ-Harm) controlling for the same variables as in the path analyses. The results of this multiple linear regression in which both BMQ-overuse and BMQ-Harm were included are presented in **Table 4-34**. Neither BMQ-overuse nor BMQ-Harm influenced PROMEX (i.e., participants' views of online medication rating websites) ($p \geq 0.05$).

4.17 Beliefs about Medications and the Overall Rating of Antihypertensive Regimens

4.17.1 The Association between BMQ-Overuse and the Overall Rating of Antihypertensive Regimens

The results of the regression analysis that examined the association between BMQ-Overuse and the overall rating of antihypertensive medication are presented in **Table 4-35**. The overall rating of antihypertensive medication regimens did not significantly influence the BMQ-Overuse controlling for age, race, education, and health literacy, number of prescription medications, comorbidities, gender, and marital status ($p \geq 0.05$). Female participants were more likely to have high BMQ-Overuse score compared to male participants ($\beta=1.204$, $p=0.024$), controlling for their age, race, education, and health literacy, number of prescription medications, comorbidities, and marital status. On the other hand, the number of prescription medication negatively influenced the BMQ-Overuse score ($\beta=-0.256$, $p=0.014$), controlling for their age, race, education, and health literacy, comorbidities, overall rating of antihypertensive medication regimens, gender, and marital status.

4.17.2 The Association between BMQ-Harm and the Overall Rating of Antihypertensive Regimens

The results of the regression analysis that examined the association between BMQ-Harm and the overall rating of antihypertensive medication are presented in **Table 4-36**. The overall rating of antihypertensive medication regimens significantly influenced the BMQ-Harm ($\beta=-0.601$; $p=0.035$). The higher overall rating of antihypertensive medication regimens, the less likely participants believe medications are harmful controlling for age, race, education, health literacy, number of prescription medications, comorbidities, gender, and marital status. Further, age ($\beta=-0.077$; $p=0.009$), and education ($\beta=-0.219$; $p=0.024$), significantly influenced the BMQ-Harm score. The older the participants, and the lower their level of education the less likely they believe that medications are harmful controlling for race, health literacy, number of prescription

Table 4-34.   Multiple linear regression: The association between PROMEX and BMQ-Overuse and BMQ-Harm (n=286).

Variable	Beta (β) estimate	p-Value	95% Confidence Limits	
			Lower	Upper
BMQ-Overuse	−0.02	0.855	−0.26	0.221
BMQ-Harm	−0.04	0.707	−0.30	0.209
PCAS-Communication	0.023	0.208	−0.01	0.060
Age	−0.01	0.756	−0.09	0.067
Number of prescription medications	0.146	0.227	−0.09	0.385
Education	−0.02	0.834	−0.28	0.230
Race	0.856	0.100	−0.16	1.879
Gender	−0.60	0.427	−2.09	0.891

Notes: R-Square= 0.02. (*)=p<0.05.

Table 4-35.   Multiple linear regression: The association between hypertensive participants' overall ratings of their antihypertensive medication regimens and BMQ-Overuse (n=193).

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
Overall rating of HTN medications	−0.514	0.053	−1.036	0.007
Age	−0.005	0.849	−0.059	0.048
Comorbidity score	0.048	0.688	−0.190	0.287
Education	0.070	0.434	−0.107	0.249
Race	−0.050	0.883	−0.733	0.632
Health literacy	−0.036	0.946	−1.121	1.048
Gender	1.204	0.024*	0.160	2.248
Number of prescription medications	−0.256	0.014*	−0.461	−0.052
Marital status	−0.208	0.659	−1.138	0.722

Notes: R-Square=0.12. (*)=p<0.05.

Table 4-36. **Multiple linear regression: The association between hypertensive participants' overall ratings of their antihypertensive medication regimens and BMQ-Harm (n=193).**

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
Overall rating of HTN medications	−0.601	0.035*	−1.161	−0.042
Age	−0.077	0.009*	−0.135	−0.019
Comorbidity score	−0.041	0.747	−0.298	0.214
Education	−0.219	0.024*	−0.411	−0.028
Race	−0.041	0.909	−0.767	0.683
Health literacy	−0.002	0.997	−1.163	1.158
Gender	0.529	0.354	−0.598	1.657
Number of prescription medications	−0.143	0.207	−0.366	0.080
Marital status	0.246	0.626	−0.752	1.244

Notes: R-Square= 0.13. (*)=p<0.05.

medications, comorbidities, gender, and marital status. Further, age (β=−0.077; p=0.009), and education (β=−0.219; p=0.024), significantly influenced the BMQ-Harm score. The older the participants, and the lower their level of education the less likely they believe that medications are harmful controlling for race, health literacy, number of prescription medications, comorbidities, overall rating of antihypertensive medication regimens, gender, and marital status.

4.18   Older Adult Participants' Views of Online Medication Rating Websites and Adherence to Antihypertensive Medication Regimens

4.18.1 Path Model for the Association between PROMEX and Morisky Medication Adherence Scale (MMAS-8)

The results of the path analysis that examined the association between participants' views of online medication rating websites (i.e., PROMEX) and adherence to antihypertensive medication regimens are presented in **Figure 4-14** and **Table 4-37**. The Morisky Medication Adherence scale (MMAS-8) (i.e., medication adherence) was not associated with participants' views of the online medications rating websites (i.e., PROMEX) (p≥0.05). Moreover, none of the other exogenous variables (i.e., age, education, gender, etc.) were associated with PROMEX (p≥0.05). However, participants' satisfaction with physician communication (i.e., PCAS-Communication) was positively associated with medication adherence (β=0.22; p=0.003). Participants with high levels of satisfaction with physician communication (i.e., high PCAS-Communication score) were more likely to have high adherence levels to their antihypertensive medication regimens. Further, age was also positively associated with medication adherence (β=0.26; p=0.001). Adherence to antihypertensive medication regimens increased as the age of the participants increased. In addition, the overall rating of regimens were positively associated with medication adherence (β=0.21; p=0.003). The higher the overall rating of regimens, the more likely participants will be adherent to the regimens. Education, gender, age, comorbidities, the number of prescription medications, Beliefs about Medicine (BMQ) General-Overuse domain, and race were not associated with medication adherence (p≥0.05). Further, BMQ-Harm was negatively associated with participants' overall rating of their regimens (β=−0.18; p=0.018). Older adults who did not believe medications are generally harmful were more likely to give a high overall rating to their regimens. Health literacy was also positively associated with the overall rating of regimens (β=0.24; p=0.001). Participants with good health literacy level were more likely to give high overall rating to their regimens. On the other hand, the number of prescription medications taken was not associated with the overall rating of antihypertensive medications (p≥0.05). An analysis of the fit indices indicated adequate model fit (comparative fit index=0.985, adjusted goodness of fit index=0.995, root mean square error of approximation=0.02, and standardized root mean square residual=0.035).
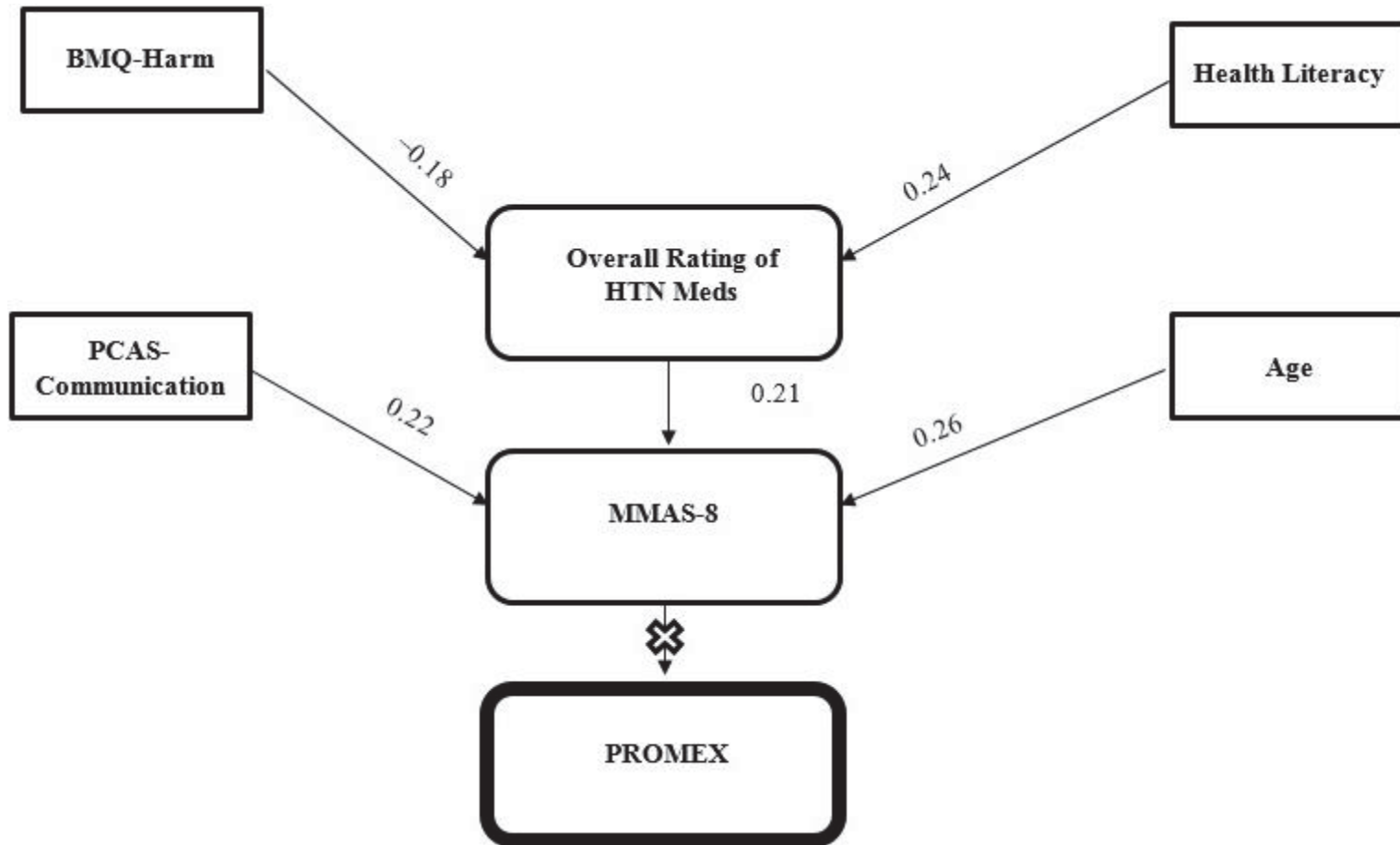
Figure 4-14.   Path analysis: The association between PROMEX and MMAS-8 (adherence).

Table 4-37.   Path analysis: Standardized direct, indirect, and total effects of the variables evaluated on PROMEX and MMAS-8 (n=286).

Outcome variables	R^2	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
Patient Reviews of Medication Experiences (PROMEX)	0.018	Medication Adherence	−0.13	0.00	−0.13	0.079
		Age	0.00	−0.03	−0.03	0.118
		BMQ-Overuse	0.00	0.002	0.002	0.836
		BMQ-Harm	0.00	0.005	0.005	0.208
		Race	0.00	0.011	0.011	0.355
		Overall Rating HTN Meds	0.00	−0.02	−0.02	0.134
		Communication	0.00	−0.03	−0.03	0.136
		Comorbidities	0.00	−0.00	−0.00	0.933
		Gender	0.00	−0.01	−0.01	0.280
		Health Literacy	0.00	−0.006	−0.006	0.176
		Number of Prescription Medications	0.00	−0.00	−0.00	0.241
		Education	0.00	0.011	0.011	0.353
Medication adherence (MMAS-8)	0.211	BMQ-Overuse	−0.01	0.00	−0.01	0.835
		Gender	0.100	0.00	0.100	0.168
		Overall Rating of HTN Meds	0.207	0.00	0.207	0.003*
		Communication	0.218	0.00	0.218	0.003*
		Age	0.260	0.00	0.260	0.001*
		Education	−0.08	0.00	−0.08	0.272
		Comorbidities	−0.006	0.00	−0.006	0.933
		Race	−0.08	0.00	−0.08	0.275
Overall rating of hypertension (HTN) medication regimen	0.123	BMQ-Harm	−0.17	0.00	−0.17	0.018*
		Health Literacy	0.237	0.00	0.237	0.001*
		Number of Prescription Medications (RX number)	0.142	0.00	0.142	0.056

Notes: R-Square=0.01. (*)=p<0.05.

4.18.2 Regression Model for the Association between PROMEX and Morisky Medication Adherence Scale (MMAS-8)

The results of the regression model that examined the association between PROMEX and MMAS-8 are presented in **Table 4-38**. Medication adherence to antihypertensive medication regimens did not influence participants' views of online medication rating websites (i.e., PROMEX) (p≥0.05), however, comorbidity score did influence PROMEX (β=0.492; p=0.045). Hypertensive participants with multiple comorbidities or diseases were more likely to have favorable views of online medication rating websites controlling for their medication adherence, satisfaction with physician communication, beliefs about medications, overall rating of antihypertensive medication regimens, age, education, race, health literacy, gender, the number of prescription medications, and marital status.

4.19 Medication Adherence and the Overall Rating of Antihypertensive Regimens

The results of the regression model that examined the association between medication adherence and the overall rating of antihypertensive medication regimens are presented in **Table 4-39**. As with path analysis, the overall rating of antihypertensive medication regimens was positively associated with Morisky Medication Adherence Scale Score (MMAS-8) (β=0.408; p=0.004). The higher the overall rating of antihypertensive medication regimens, the higher the adherence level to these medication regimens controlling for age, comorbidities, education, race, health literacy, gender, number of prescription medications, and marital status. Further, age was positively associated with medication adherence to the regimens controlling for the overall rating of these medication regimens, comorbidities, education, race, health literacy, gender, the number of prescription medications, and marital status (β=0.049; p=0.001).

4.20 An Overarching Path Model of the Association between Older Adults' Views of Online Medication Rating Websites and Participant-Reported Outcomes

The results of the path model that examined the association of participants' online medication rating websites (i.e., PROMEX), health-related quality of life (i.e., PCS-12 and MCS-12), and beliefs about medications (i.e., BMQ-Harm and BMQ-Overuse) are presented in **Figure 4-15** and **Table 4-40**. The healthcare decision sharing preference was positively associated with PROMEX (β=0.179; p=0.003). Participants who like to have an equal partnership with their physicians concerning their healthcare were likely to have favorable views of the online medication rating websites compared to those who like to either keep their healthcare decision in their own hands or leave it in the doctors' hands. Further, both PCS-12 (β=−0.129; p=0.033) and MCS-12 (β=−0.130; p=0.032) of the SF-12v2 were negatively associated with PROMEX. Participants with poor physical and mental HRQoL were more likely to have favorable views of the online medication rating websites compared to those with good quality of life. In addition, comorbidity score was positively associated with PROMEX (β=0.059; p=0.007). Participants with multiple diseases or comorbidities were more likely to view the online medication rating websites

Table 4-38. Multiple linear regression: The association between participants' medication adherence (MMAS-8 Score) and PROMEX (n=286).

Variable	Beta (β) estimate	p-Value	95% Confidence limits Lower	Upper
MMAS-8 (adherence)	−0.460	0.146	−1.084	0.163
PCAS-Communication	0.040	0.125	−0.011	0.092
BMQ-Overuse	0.078	0.670	−0.284	0.441
BMQ-Harm	0.082	0.633	−0.257	0.422
Overall rating of HTN medications	−0.425	0.446	−1.529	0.677
Age	0.030	0.608	−0.085	0.146
Comorbidity score	0.492	0.045*	0.009	0.975
Education	−0.069	0.715	−0.445	0.306
Race	0.953	0.171	−0.416	2.322
Health literacy	0.406	0.720	−1.831	2.644
Gender	−1.321	0.235	−3.513	0.869
Number of prescription medications	−0.020	0.927	−0.454	0.414
Marital status	−0.073	0.939	−1.963	1.817

Notes: R-Square= 0.09. (*)=p<0.05.

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Table 4-39.   Multiple linear regression: The association between overall ratings of antihypertensive medication regimens and MMAS-8 score (n=193).

Variable	Beta (β) estimate	p-Value	95% Confidence limits	
			Lower	Upper
Overall rating of HTN medications	0.408	0.004*	0.131	0.684
Age	0.049	0.001*	0.020	0.078
Comorbidity score	0.020	0.749	−0.119	0.133
Education	−0.053	0.268	−0.143	0.046
Race	−0.124	0.502	−0.503	0.220
Health literacy	0.478	0.102	−0.103	1.047
Gender	0.403	0.153	−0.107	0.999
Number of prescription medications	−0.010	0.851	−0.113	0.103
Marital status	0.269	0.282	−0.235	0.752

Notes: R-Square=0.19. (*)=p<0.05.

Figure 4-15.   Path analysis: The association between PROMEX and PROs.

Notes: Dashed lines represent the indirect relationships. Continuous lines represent direct relationships.
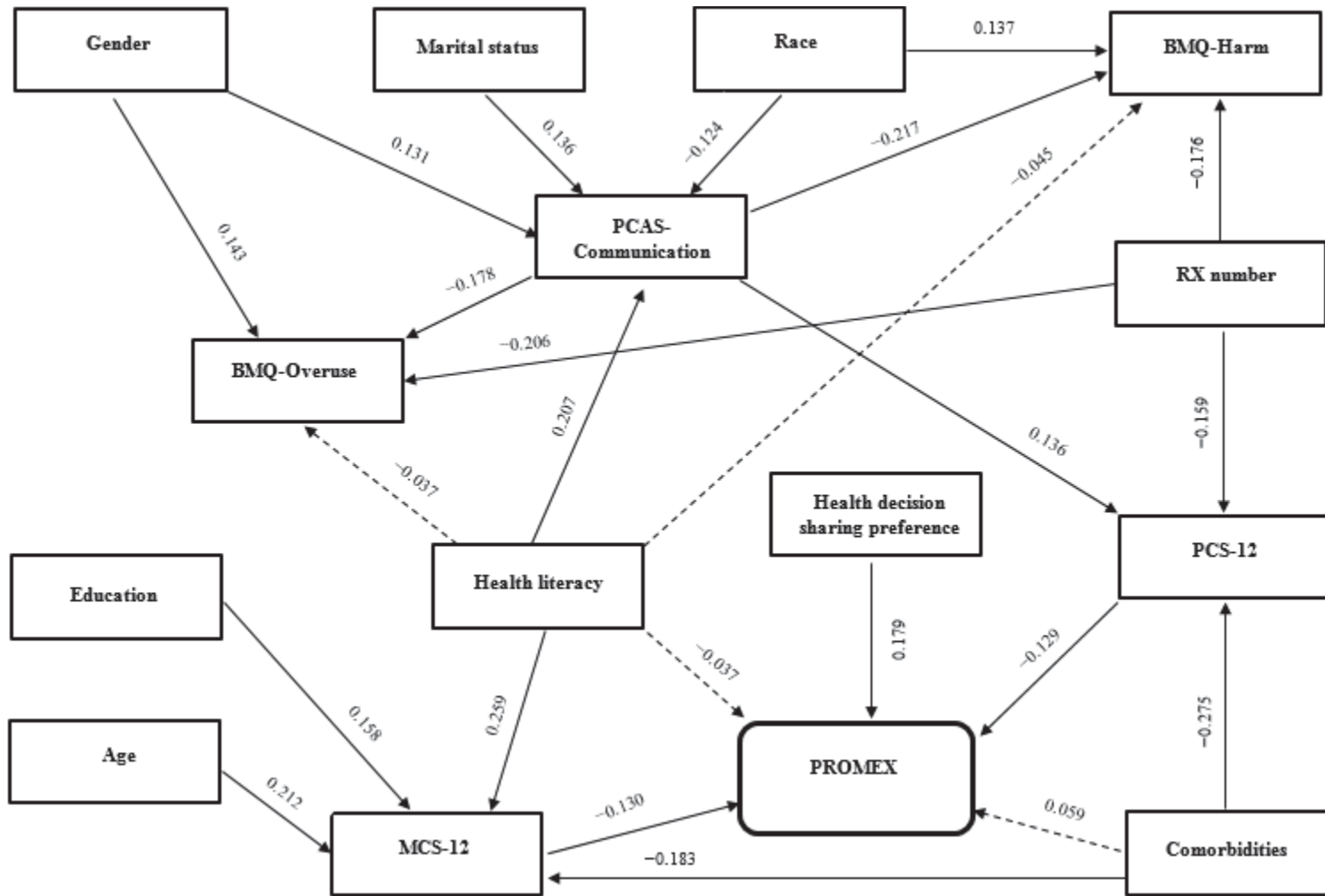
Table 4-40. Standardized direct, indirect, and total effects of the variables evaluated on PROMEX, PCS-12, MCS-12, BMQ-Harm and BMQ-Overuse, and PCAS-Communication scales (n=286).

Outcome variables	R²	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
Patient Reviews of Medication Experiences (PROMEX)	0.063	Healthcare decision sharing	0.179	0.00	0.179	0.003*
		SF-12v2 Physical Component Summary (PCS-12)	−0.129	0.00	−0.129	0.033*
		SF-12v2 Mental Component Summary (MCS-12)	−0.130	0.00	−0.130	0.032*
		PCAS-Communication	0.00	−0.02	−0.02	0.057
		Age	0.00	−0.01	−0.01	0.319
		Comorbidities	0.00	0.059	0.059	0.007*
		Education	0.00	−0.01	−0.01	0.177
		Race	0.00	0.003	0.003	0.168
		Gender	0.00	−0.00	−0.00	0.155
		Health literacy	0.00	−0.037	−0.037	0.034*
		Marital status	0.00	−0.01	−0.01	0.141
		Number of prescription medications	0.00	−0.02	−0.02	0.113

Table 4-40.   Continued.

Outcome variables	R²	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
SF-12v2 Mental Component Summary (MCS-12)	0.179	Marital status	0.089	0.00	0.089	0.124
		PCAS-Communication	0.068	0.00	0.068	0.251
		Age	0.212	0.00	0.212	0.001*
		Education	0.158	0.00	0.158	0.007*
		Health literacy	0.259	0.00	0.259	<0.001*
		Comorbidities	−0.183	0.00	−0.183	0.001*
		Gender	0.00	0.008	0.008	0.312
		Race	0.00	−0.00	−0.00	0.319
SF-12v2 Physical Component Summary (PCS-12)	0.176	Age	−0.076	0.00	−0.076	0.193
		PCAS-Communication	0.136	0.00	0.136	0.017*
		Number of prescription Medications	−0.159	0.00	−0.159	0.017*
		Comorbidities	−0.275	0.00	−0.275	<0.001*
		Education	−0.007	0.00	−0.007	0.904
		Race	0.00	−0.01	−0.01	0.125
		Gender	0.00	0.017	0.017	0.110
		Health literacy	0.00	0.028	0.028	0.052
		Marital status	0.00	0.018	0.018	0.104
PCAS-Communication	0.1	Race	−0.123	0.00	−0.123	0.043*
		Gender	0.131	0.00	0.131	0.030*
		Health literacy	0.206	0.00	0.206	0.001*
		Marital status	0.135	0.00	0.135	0.025*

Table 4-40.   Continued.

Outcome variables	R^2	Predictor variables	Standardized direct effect (β)	Standardized indirect effect (β)	Standardized total effect (β)	p-Value
BMQ-Harm	0.1	PCAS-Communication	−0.21	0.00	−0.21	0.001*
		Race	0.136	0.00	0.136	0.014*
		Number of prescription medications	−0.17	0.00	−0.17	0.003*
		Gender	0.00	−0.02	−0.02	0.064
		Health literacy	0.00	−0.044	−0.044	0.013*
		Marital status	0.00	−0.02	−0.02	0.058
BMQ-Overuse	0.1	PCAS-Communication	−0.178	0.00	−0.178	0.002*
		Gender	0.143	0.00	0.143	0.009*
		Number of prescription medications	−0.206	0.00	−0.206	0.001*
		Race	0.00	0.022	0.022	0.095
		Health literacy	0.00	−0.03	−0.03	0.025*
		Marital status	0.00	−0.02	−0.02	0.074

Notes: (*) =p<0.05

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favorably compared to the healthy participants. Further, health literacy was negatively associated with PROMEX ($\beta=-0.037$; $p=0.034$). Participants with good health literacy were less likely to view the online medication rating websites favorably than those with limited health literacy. Age, education, and health literacy were positively associated with the MCS-12, whereas, the comorbidity score was negatively associated with it ($p<0.05$). The PCAS-Communication was positively associated with the PCS-12, however, the number of prescription medication and the comorbidity score were negatively associated with it ($p<0.05$). Gender, health literacy, and marital status were positively associated the PCAS-Communication, whereas, race was negatively associated with it ($p<0.05$). Race was positively associated with BMQ-Harm; however, the PCAS-Communication, health literacy, and the number of prescription medications were negatively associated with it ($p<0.05$). Finally, health literacy, number of prescription medications, and the PCAS-Communication were negatively associated with BMQ-Overuse; however, gender was positively associated with it. An analysis of the fit indices indicated adequate model fit (comparative fit index=0.977, adjusted goodness of fit index=0.994, root mean square error of approximation=0.03, standardized root mean square residual=0.03).

CHAPTER 5.   DISCUSSION

5.1   Overview

The advent of the Internet has revolutionized health care delivery (Campbell & Nolfi, 2005). Today, patients can go online to browse an immense amount of educational information about a variety of health conditions and treatment options. Further, patients can go online and read other patients' feedback about different physicians and health products to make informed decisions before choosing a certain physician or over-the-counter (OTC) medication (Emmert, Meier, et al., 2013; Faber et al., 2009). Medication rating websites are a new frontier in the online health-related websites market. Currently, patients can go online and post their feedback about the medications they are taking for others to read. These websites ask patients who want to share their medication experiences with others to rate these medications in terms of their effectiveness, side effects, cost, etc… The online medication rating websites have the potential as other online health-related information websites, to empower patients to ask more questions during their physician office visits, adopt healthy lifestyle habits, follow their physicians' advice more closely, and improve their health outcomes (Iverson, Howard, & Penney, 2008; Lau, Campbell, Tang, Thompson, & Elliott, 2014). These potential benefits of the online medication rating websites are needed especially among the U.S. elderly (≥65 years).

According to Pew Internet and American Life Project, six in ten or 59% of U.S. seniors reported using the Internet in 2013 (i.e. 59%) (Duggan & Smith, 2013). Older adults are more likely to have chronic diseases (i.e., diabetes and hypertension) than their younger counterparts (N. C. o. Aging, 2014). Additionally, more than 80% of U.S. older adults take at least one prescription medication, and about one third take five or more prescription medications daily (Qato et al., 2008). Further, infirm patients such as elderly are prone to medication side effects due to their diminished physiological reserve (Wasson, 2008). Moreover, several studies that examined the appropriateness of physician prescribing patterns among elderly have found multiple prescribing patterns that were inconsistent with evidence-based practice (Goulding, 2004; Spinewine et al., 2007). Therefore, older adults are well poised to evaluate the usefulness of the online medication rating websites.

The aim of this study was to examine the association between older adults' views of the online medication rating websites in terms of facilitating patient-physician communication and participant-reported outcomes, i.e., and their satisfaction with physician communication, health-related quality of life, beliefs about medications, and medication adherence. Further, the association between older adults' actual overall rating/evaluation of their antihypertensive medications and each of the aforementioned participant-reported outcomes was examined. The final sample of this study was 286 participants that examined the association between the value of online medication rating websites to older adults (i.e., PROMEX) and each of the participant-reported outcomes with the exception of medication adherence. The sample size for both path and regression

analyses that examined the association between PROMEX and medication adherence among hypertensive participants was 193. Finally, the sample size for the regression analyses that examined the association between each of the participant-reported outcomes and the overall rating of antihypertensive medications among the hypertensive participants was 193.

5.2 Patient Reviews of Medication Experiences (PROMEX)

In order to assess older adults' views of online medication rating websites, we developed a self-report questionnaire, Patient Reviews of Medication Experiences (PROMEX). First, participants were presented with a table that included five commonly prescribed antihypertensive medications that were rated online by anonymous users. Then, participants were asked to answer seven questions that explored their views of online medication rating websites like the example in table. After refining this instrument, the final questionnaire includes six questions with a Cronbach's alpha of 0.85. Although we proposed two domains or constructs within this questionnaire, only one construct was extracted from it. We named this construct the "value of online medication rating websites to older adults". Therefore, PROMEX is sufficiently reliable to measure the value of online medication rating websites in terms of facilitating physician-patient communication among this surveyed sample of older adults (Field, 2009).

5.3 PROMEX and Participant-Reported Outcomes (PROs)

Participants' views of online medication rating websites (i.e., PROMEX) were not influenced by the sociodemographic factors **(Table 4-7)**. Further, PROMEX was not associated with participants' health-related quality of life or HRQoL, satisfaction with physician communication, beliefs about medications, and medication adherence **(Table 4-21)**. However, in the path analyses that we conducted to determine the causal effects among the variables of participants' views of online medication rating websites (PROMEX), HRQoL (PCS-12 and MCS-12), satisfaction with physician communication (PCAS-Communication), and beliefs about medications (BMQ-Overuse and BMQ-Harm) several variables directly or indirectly influenced PROMEX.

The Physical Component Summary (PCS-12) of the SF-12v2 that measured the physical quality of life of the older adult participants in the past four weeks was significantly associated with their views of online medication rating websites (PROMEX) ($p<0.05$) **(Figure 4-11** and **Table 4-27)**. Participants with poor physical HRQoL were more likely to have favorable views of online medication rating websites than those with good physical HRQoL ($\beta= -0.13$, $p=0.040$). Further, older adults with poor physical HRQoL were more likely to be unsatisfied with their physician communication than those with good physical HRQoL ($\beta= 0.13$, $p=0.035$). Additionally, participants with poor physical HRQoL were more likely to have multiple comorbidities (i.e., chronic diseases) than those with good physical HRQoL ($\beta= -0.36$, $p<0.001$). Moreover, older

participants were more likely to have poor physical HRQoL ($\beta= -0.12$, p=0.048). Further, participants with poor physical HRQoL were more likely to be on multiple prescription medications than those with good physical HRQoL ($\beta= -0.16$, p=0.017) **(Table 4-40)**.

Similarly, the Mental Component Summary (MCS-12) of the SF-12v2 that measured the mental HRQoL of the participants in the past four weeks was significantly associated with participants' views of online medication rating websites (PROMEX) (p<0.05) **(Figure 4-15** and **Table 4-40)**. Contrary to the PCS-12, the significant association between MCS-12 and PROMEX was not detected in the path model the investigated the association between only MCS-12 and PROMEX, but rather in the overarching path model that included the entire participant-reported outcome variables. Participants with poor mental HRQoL were more likely to have favorable views of online medication rating websites compared to participants with good HRQoL ($\beta= -0.13$, p=0.032). Further, participants with poor mental HRQoL were more likely to have multiple comorbidities than those with good mental HRQoL ($\beta= -0.18$, p=0.001). In addition, participants with poor mental HRQoL were more likely to have limited health literacy ($\beta= 0.26$, p<0.001). Interestingly, participants who were younger ($\beta=0.21$, p=0.001) and participant who had less education ($\beta= 0.16$, p=0.007) were more likely to have poor mental HRQoL.

Therefore, the older adults in this study who had poor physical and mental HRQoL believed that the online medication rating websites are useful and helpful in facilitating the communication with their physicians. Further, the fact that the older adults with poor HRQoL were more likely to have multiple comorbidities, take multiple prescription medications, have limited health literacy, and lower education is consistent with the literature (Low & Molzahn, 2007). What is more interesting is that these very factors not only influenced the participants' HRQoL they also influenced participants' views of online medication rating websites. Elderly participants with multiple comorbidities (i.e., chronic diseases) were more likely to view the online medication rating websites more favorably than their healthier counterparts were. The hypertensive participants' views of online medication rating websites were directly influenced by their comorbidity score as shown in **Table 4-39** controlling for sociodemographics, medication adherence, number of prescription medications, overall rating of antihypertensive medications, satisfaction with physician communication, and beliefs about medications ($\beta=0.492$, p=0.045). Further, the comorbidity score indirectly influenced the participants' views of online medication rating websites (i.e., hypertensive and non-hypertensive) ($\beta=0.059$, p=0.007) **(Table 4-40)**. In addition, participants with limited health literacy were more likely to have positive views of online medication rating websites than those with good health literacy ($\beta=-0.037$, p=0.034) **(Table 4-40)**. Moreover, participants who liked to share the health decision with physicians were more likely to view the online medication rating websites more favorably than those who liked to keep the health decision to themselves or leave it to their physicians ($\beta=0.179$, p=0.003) **(Table 4-40)**.

These findings suggest that older adults with multiple chronic health conditions and limited health literacy perceive the online medication rating websites more useful in terms of facilitating the communication with their physicians than their healthier and

more educated counterparts. This partly may be explained by the fact that the online patients' reviews of medications were written in nonprofessional terms and show the rating of medications in a simple way (i.e., star ratings) for an average person to understand. However, well-educated older adults with good health literacy level may prefer to refer to other traditional sources of information (i.e., books, medical articles, magazines) should they need to know about a certain medication (Campbell & Nolfi, 2005). Further, older adults with poor physical HRQoL were more likely to be on multiple medications. Therefore, they are more likely to experience medication side effects (Borchelt, 1994). This is consistent with the medical literature, in which medication side effects had negative impact on both the physical and mental aspects of patients' quality of life (Bebbington et al., 2009). Hence, the favorable opinion of online patients' reviews of medications among older adults with poor physical HRQoL may stem from the fact that they want to know about other treatment options that have better safety and efficacy profiles than their current medications. In addition, participants with poor physical HRQoL were more likely to be unsatisfied with physician communication.

Effective physician-patient communication, in which physicians recognize patients' needs and concerns, listen attentively, and explain thoroughly in a simplified way the treatment plan to their patient, is quintessential in any patient-centered care model (Berwick, 2009). Research has shown that the quality of physician-patient communication can indirectly predict multiple health outcomes such as medication adherence and quality of life (Stewart, 1995; Street Jr et al., 2009). Therefore, the older adult participants in this study with poor physical HRQoL, who were more likely to be unsatisfied with their physicians' communication, may have felt that the online patients' reviews of medication could facilitate their communication with physicians. This is further substantiated when we know that the average amount of time that physicians spend with their patients is fifteen minutes ((Belzer, 1999; Morgan, 2003). Further, research has shown that older adults receive less information from physicians than their younger counterparts receive during their clinic visits (Beisecker, 1988). Thus, older adults may want to use the little time they have with their physicians more efficiently, and the online patients' reviews of medications may help them achieve this goal. Further, older adults with multiple comorbidities, who were more likely to have poor quality of life (i.e., both physical and mental health), were more likely as well to have favorable views of the online patients' reviews of medications. This is consistent with the literature in which the presence of multiple health issues among older adults motivated them to seek health-related information online (Meloche, 2013).

Most patients like to have a partnership or a therapeutic alliance with physicians to manage their health conditions (Bernabeo & Holmboe, 2013; Mazur, Hickam, Mazur, & Mazur, 2005). However, many older adults complain about being marginalized in their health decision-making process (Gladden, 2000). The majority of participants in this study expressed their desire to have an equal partnership with their physicians **(Table 4-1)**. Further, older adults in this study who liked to have an equal partnership with their physicians were more likely to have favorable views of online patients' reviews of medications. Therefore, these older adults were more likely to believe that the online patient reviews of medications will facilitate the communication with their

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physicians. Hence, the online patients' reviews of medications could play a patient-empowering role like other online health-related information (Meloche, 2013; Suter, Suter, & Johnston, 2011).

The participants' satisfaction with physician communication (PCAS-Communication) was not associated with their views of the online medication rating websites (PROMEX) **(Figure 4-9** and **Table 4-23)**. However, multiple sociodemographic factors influenced the participants' satisfaction with their physicians' communication. Female, married, and Caucasian non-Hispanic participants with good health literacy were likely to have higher PCAS-Communication scores ($p<0.05$) **(Table 4-23** and **Table 4-40)**. Therefore, these participants were more likely to be satisfied with their physician communication. Our findings are consistent with the literature. Female patients are usually more satisfied with the provided health care than their male counterparts (Arora & McHorney, 2000; Carlin et al., 2012). Further, married patients are more likely to be satisfied with medical care that the unmarried patients (Hall & Dornan, 1990; Xiao & Barber, 2008). In addition, patients with better education and health literacy are more likely to be satisfied with the received health care than the patients with less education and limited health literacy (Xiao & Barber, 2008). Moreover, whites are more likely than minorities (i.e., blacks, Hispanics, and Asians) to be satisfied with the provided health care (Haviland, Morales, Reise, & Hays, 2003). Finally, the PCAS-Communication and PCAS-interpersonal treatment were highly correlated. The participants in this study, who were satisfied with their physician communication, were also likely to be satisfied with their physician interpersonal treatment (i.e., amount of time spent, friendliness and warmth received, patience, care and concern, and respect).

Participants' general beliefs about medications (BMQ-Overuse and BMQ-Harm) were not associated with their views of the online medication rating websites (PROMEX) **(Figures 4-12, 4-13** and **Tables 4-33, 4-34)**. However, the BMQ-Overuse and BMQ-Harm were influenced by several factors. The BMQ-Overuse and BMQ-Harm scores were significantly lower among participants who take multiple prescription medications ($p<0.05$) **(Tables 4-13** and **4-14)**. As the number of prescription medications taken by the participants increased, their BMQ-Overuse and BMQ-Harm scores decreased. Further, participants taking multiple prescription medications were less likely to believe that prescription medications are inherently harmful and overprescribed by physicians ($p<0.05$) **(Table 4-40)**. This is consistent with the literature, which shows that patients who take multiple prescription medications are more likely to have positive beliefs about medications than patients who do not take any prescription medications (Ramstrom, 2006). Further, participants with good health literacy level were more likely to have a lower BMQ-Overuse and BMQ-Harm scores than their counterparts with limited health literacy ($p<0.05$) **(Table 4-40)**. This is also consistent with the literature; patients with high literacy level are more likely to have positive beliefs about medications in comparison to the ones with limited health literacy level (Horne et al., 2004; Isacson & Bingefors, 2002). Additionally, research has shown that effective physician-patient communication had a positive impact on patients' beliefs about medication (Bultman & Svarstad, 2000). In our study we have found that the higher the satisfaction with physician communication (i.e., high PCAS-Communication score), the more likely the

participants will have positive beliefs about medications (low BMQ-Overuse and BMQ-Harm scores) ($p<0.05$) **(Table 4-40)**. The impact of participants' gender on their beliefs about medications is controversial. Some studies have indicated that men are more likely to have negative views about prescription medications in comparison to women (Horne et al., 2004). However, other studies have shown the opposite (Isacson & Bingefors, 2002). In this study, we have found that women are more likely to believe that prescription medications are being overused and overprescribed (i.e., high BMQ-Overuse scores) ($p<0.05$) **(Tables 4-33** and **4-41)**. Race is another interesting factor. Research has shown that Caucasians are more likely to have positive views of prescription medications than minorities (i.e., blacks, Hispanics, and Asians), who tend to have negative views of medications (Horne et al., 2004; Iihara et al., 2004). Similarly, Caucasians participants in this study were less likely to believe that prescription medications are inherently harmful or poisonous (i.e., high BMQ-Harm score) in comparison to minority participants (i.e., African Americans, Hispanics, and Asians) ($p<0.05$) **(Tables 4-34** and **4-41)**.

Adherence to antihypertensive medication regimens among the study participants who reported having hypertension was measured using Morisky Medication Adherence scale (MMAS-8). The number of participants with hypertension who reported low or medium adherence levels (i.e., MMAS-8 score ≤6) was 111 participants, which represented 50.9% of the hypertensive subsample **(Table 4-16)**. We examined the association between the hypertensive participants' views of online medication rating websites (i.e., PROMEX) and their adherence to their antihypertensive medications; however, no significant association was found ($p≥0.05$) **(Figure 4-14** and **Table 4-38)**. Nonetheless, adherence to antihypertensive medication regimens was associated with several variables. Participants who were satisfied with their physicians' communication (i.e., high PCAS-Communication scores) were more likely to achieve high adherence levels to their antihypertensive medication regimens (i.e., high MMAS-8 scores) than their unsatisfied counterparts (i.e., low PCAS-Communication scores). This is consistent with the findings in the literature that effective physician-patient communication is highly correlated with better patient adherence (Zolnierek & DiMatteo, 2009). Further, participant adherence to antihypertensive medication regimens improved with increasing age **(Table 4-17)**. Older participants were more likely to be adherent to their prescribed antihypertensive medication regimens **(Table 4-38)**. The role of age as a determinant of medication adherence is controversial. Some studies have found that medication non-adherence is common among the older adults due to their tendency to forget (Krousel-Wood et al., 2009). However, our results seem to support the findings of other studies, which suggest that older adults are more likely to be adherent to their prescribed medication regimens than their younger counterparts (Billups et al., 2000; Cohen et al., 2012).

Race is another sociodemographic factor that has shown to affect patient adherence to prescription medications (Rolnick, Pawloski, Hedblom, Asche, & Bruzek, 2013). Research has shown that racial differences in medication adherence remains an issue even after controlling for insurance status (Zhang & Baik, 2014). In our study, race was not associated with adherence to antihypertensive medications in both the path and regression analyses; however, the proportion of participants with high level of adherence

to antihypertensive medications (i.e., MMAS-8 score=8) was significantly higher among Caucasians compared to African Americans, Hispanics, and the other racial groups **(Table 4-17)**. Additionally, participants with good health literacy level and positive views of medications (i.e., low BMQ-Harm scores) were more likely to have a high overall rating of their antihypertensive medication regimens. This, in turn was positively associated with medication adherence **(Figure 4-14)**. Participants with high overall rating of their antihypertensive medication regimens were more likely to be adherent to these medication regimens. This supports the findings of other published studies, which found a positive association between hypertensive patients' overall satisfaction with their antihypertensive medications and their medication adherence levels (Bharmal et al., 2009; Sa'ed et al., 2013). Finally, although researchers have shown significant association between patient beliefs about medications and medication adherence, this association was not significant among our participants in our study (Horne & Weinman, 1999).

5.4   Participants' Rating of Their Antihypertensive Medications and Participant-Reported Outcomes (PROs)

We asked the hypertensive participants to write down the names of their antihypertensive medications and rate each one of them on a five-point Likert scale (i.e., 1-low to 5-high) based on their effectiveness, side effects, cost of medication, ease of use, food interactions, and then provide an overall rating to that medication. Since older adults with hypertension may take multiple medications to control their hypertension, we provided space for four different antihypertensive medications. The higher the rating of the medication, the more likely the participants are satisfied with their antihypertensive medications. Ten or more hypertensive participants rated the following antihypertensive medications: Atenolol, Amlodipine, Hydrochlorothiazide (HCTZ), Lisinopril, Losartan, Valsartan, and Metoprolol. Then, we compared the participants' ratings of these medications in terms of their effectiveness, side effects, cost of medication, and ease of use, food interactions, and overall ratings **(Figure 4-2** and **Table 4-20)**. Although there was not a significant difference in the ratings of these medications given the small sample size, participants rated them differently. For example, the overall ratings of Amlodipine and lisinopril were high and comparable to the other antihypertensive medications; however, their side effect ratings were the lowest compared to the other antihypertensive medications **(Figure 4-7)**. This could be attributable to the higher likelihood of drug-induced throat irritation and cough as well as angioedema particularly among the African Americans in the case of Lisinopril (Gibbs, Lip, & Beevers, 1999; Naidu, Usha, Rao, & Shobha, 2000). Further, the incidence of dizziness and ankle edema with Amlodipine is higher among the elderly hypertensive patients compared to their younger counterparts (Kloner, Sowers, DiBona, Gaffney, & Marilee, 1996; Naidu et al., 2000). Another example is with Hydrochlorothiazide (HTCZ), which had the highest cost of medication rating compared to the other antihypertensive medications that were rated by ten or more participants **(Figure 4-5)**. This could be explained by the fact that Hydrochlorothiazide as well as other diuretics had the lowest out-of-pocket expense per Medicare beneficiary

with hypertension per year, according to the U.S. Agency for Healthcare Research and Quality (Townsend et al., 2011).

However, since we are interested in the participant-specific ratings of antihypertensive medication regimens and not the medication-specific ratings, we have taken the average rating of each aspect of medication use (i.e., effectiveness, side effects, cost of medication, ease of use, food interaction, and the overall ratings) for every participant who reported taking medications for hypertension. The average participant-specific ratings of the antihypertensive medication regimens across the visited senior centers are listed in **Table 4-18**. All of the participant-specific aspects of medication use were positively correlated with each other (p<0.05) **(Table 4-19)**. However, the correlations between the rated aspect of medication use and the participant-reported outcomes were not all significant **(Table 4-22)**. The participant-specific effectiveness rating of the antihypertensive medication regimens was positively correlated with the PCAS-Communication, PCAS-interpersonal treatment, and with the PCS-12 of the SF-12v2 (p<0.05). Further, participant-specific ease of use rating of the antihypertensive medication regimens was positively correlated with the PCAS-Communication (p<0.05). Moreover, participant-specific overall rating of the antihypertensive medication regimens was positively correlated with the PCAS-Communication and PCAS-interpersonal treatment and was negatively correlated with the BMQ-Harm. The participant-specific overall rating of the antihypertensive medication regimens total correlation with the other rated medication use aspects (i.e., effectiveness, side effects, cost of medication, ease of use, and food interactions) was the highest among them (i.e., r=0.66) **(Table 4-19)**. Further, since the independent variables in the multivariate regression models should be strongly related to the dependent variable, and not to each other; we have used the participant-specific overall rating of the antihypertensive medication regimens to examine the association between the participant-reported outcomes and the participant' rating of their antihypertensive medication regimens (Tabachnick & Fidell, 2001).

The relationship between treatment satisfaction and medication adherence among hypertensive participants has been examined before, and was found to be positive and significant (Bharmal et al., 2009; Sa'ed et al., 2013). Similarly, the participants' overall rating of their antihypertensive medication regimens, which is a proxy of patient satisfaction with their hypertension treatment, was positively associated with their medication adherence (p<0.05) (Sa'ed et al., 2013). The higher the overall rating of the antihypertensive medication regimens, the more likely the participants with hypertension will be adherent to these medication regimens controlling for their age, gender, education, race, health literacy, marital status, comorbidities, and number of prescription medications **(Table 4-40)**. Although the relationship between patient satisfaction with antihypertensive medication regimens and medication adherence has been studied before (Bharmal et al., 2009; Sa'ed et al., 2013), our study findings are unique because we have examined this relationship among older adults. Medication adherence is a complex psycho-behavioral issue that is influenced by a multitude of factors including age (Gellad et al., 2011). Further, medication non-adherence among patients with chronic diseases such as hypertension has been linked to serious consequences (Osterberg & Blaschke, 2005). Therefore, understanding the relationship between treatment satisfaction and

medication adherence among older adults could help physicians in identifying strategies to address this potential barrier to medication adherence.

Patient satisfaction with physician communication had a positive impact on multiple health outcomes including medication adherence (R. Epstein & Street, 2007; Zolnierek & DiMatteo, 2009). However, few studies have examined the relationship between treatment satisfaction and patient satisfaction with physician communication (Beinart et al., 2003; Bultman & Svarstad, 2000). Therefore, we have examined the relationship between participant-specific overall ratings of antihypertensive medication regimens and the participants' satisfaction with their physicians' communication. Participants with hypertension, who highly rated their antihypertensive medication regimens, were more likely to be satisfied with their physicians' communication (i.e., high PCAS-Communication scores) than participants with low overall rating of their antihypertensive medication regimens controlling for their age, gender, education, race, health literacy, marital status, comorbidities, and number of prescription medications ($p<0.05$) **(Table 4-25)**. This indicates that physicians who effectively communicate with their patients (i.e., attentively listen, explain thoroughly, provide help and support) are more likely to prescribe medications that work for their patients from the patient perspective, and this eventually affects patients' satisfaction with their physicians' communication. Further, both the participant satisfaction with physician communication (i.e., PCAS-Communication) and the participant-specific overall rating of the antihypertensive medication regimens have significantly affected medication adherence among the older adults with hypertension in our study **(Figure 4-14)**. Hence, effective physician-patient communication is a crucial element in any successful treatment plan.

The relationship between treatment satisfaction and quality of life has been examined in multiple studies. Patient satisfaction with treatment has been linked to quality of life improvement (H. Chen et al., 2013; Porter et al., 2012; Stull et al., 2014). However, the relationship between patient satisfaction with antihypertensive medications and the quality of life among elderly patients has not been examined before. The relationship between the two component summaries of the SF-12v2 and the participant-specific overall rating of antihypertensive medication regimens was examined in multiple regression analyses controlling for age, gender, education, race, health literacy, marital status, comorbidities, and number of prescription medications. The Mental Component Summary (MCS-12) of the SF-12v2 was not associated with the participant-specific overall rating of antihypertensive medication regimens **(Table 4-31)**. However, the Physical Component Summary (PCS-12) of the SF-12v2 was positively associated with the participant-specific overall rating of antihypertensive medication regimens ($p<0.05$). The higher the participant-specific overall rating of antihypertensive medication regimens, the more likely participants will have higher PCS-12 scores **(Table 4-32)**. Thus, participants who provided a high overall rating of their antihypertensive medication regimens were more likely to have higher physical HRQoL. This indicates that participants' satisfaction with their antihypertensive medication regimens does influence their physical HRQoL. Our results are consistent with the findings in the literature, the Physical Component Summary (PCS) of the SF-36 was positively correlated with the Medication Satisfaction Questionnaire (MSQ) that is used to assess patient satisfaction

with their medications (Vernon et al., 2010). Participant satisfaction with physician communication was positively correlated with both the physical HRQoL and the overall rating of antihypertensive medications **(Tables 4-21** and **4-22)**. Therefore, understanding the relationship between patients' satisfaction with their prescription medications and their quality of life may encourage physicians to engage in patient-centered communication.

Patient beliefs about medications as well as satisfaction with prescription medications have been shown to significantly affect medication adherence (Bharmal et al., 2009; Hugon et al., 2014; Sa'ed et al., 2013). However, the relationship between the patients' beliefs about medication and the satisfaction with their prescribed medications has not been examined yet. Therefore, we have examined the association between the general domain of the Beliefs about Medicines Questionnaire (BMQ) and the participant-specific overall rating of antihypertensive medication regimens. The general domain of the BMQ consists of two scales: the BMQ-Overuse and the BMQ-Harm. The BMQ-Overuse assesses whether the patient believes that prescription medications are overprescribed by physicians and overused by patients. The higher the score of the BMQ-Overuse, the more likely patients believe that medications are overprescribed and overused, and vice versa. On the other hand, the BMQ-Harm assesses whether the patients believe that prescription medications are inherently harmful. The higher the BMQ-Harm score, the more likely patients believe that prescription medications are harmful, and vice versa (Horne et al., 1999).

The BMQ-Overuse was not associated with the participants' overall rating of their antihypertensive medication regimens; however, the BMQ-Harm was negatively associated with the overall rating of antihypertensive medication regimens **(Table 4-22)**. Further, the BMQ-Harm has negatively influenced the overall rating of antihypertensive medications, which then positively influenced medication adherence **(Figure 4-14)**. Hence, older adults who believe that medications are inherently harmful (i.e., high BMQ-Harm scores) are less likely to be satisfied with their antihypertensive medication regimens (i.e., low overall rating of their antihypertensive medication regimens). Moreover, the association between the participants' overall rating of antihypertensive medication regimens and their beliefs about medications was examined in multiple regression analyses controlling for the participants' age, gender, education, race, health literacy, marital status, comorbidities, and number of prescription medications. However, since we wanted to see whether the participants' beliefs about medication were affected by their satisfaction with the antihypertensive medications; the beliefs about medication variables (i.e., BMQ-Harm and BMQ-Overuse) were treated here as dependent variables. The participant-specific overall rating of the antihypertensive medication regimen did not significantly influence the BMQ-Overuse ($p \geq 0.05$) **(Table 4-36)**. However, the participant-specific overall rating of the antihypertensive medication regimens did negatively influence the BMQ-Harm ($p < 0.05$) **(Table 4-37)**. Thus, the participants' satisfaction with their antihypertensive medication regimens had a positive impact on their beliefs about medications. Our results should highlight the importance of choosing the right prescription medication for the elderly patients since their medication satisfaction influenced both their beliefs about medications as well as their medication

adherence. Therefore, effective physician-patient communication should yield positive beliefs about medications, better medication satisfaction, and ultimately higher medication adherence.

5.5   Limitations

We have assessed participants views of online medication rating websites using a new developed instrument (i.e., PROMEX). Although, this instrument had an adequate internal consistency and high loadings on the construct this tool is intended to assess (i.e., value of online medication rating websites to older adults), it has not been validated across different patient populations. Furthermore, the participants' satisfaction with antihypertensive medications was assessed using a newly developed tool that has not been validated, yet it achieved a high internal consistency reliability (α=0.82). Therefore, our findings cannot be generalized to other patient populations due to the aforementioned reasons as well as convenience sampling that were used in this study. Further, the likelihood of recall bias with respect to the number of prescription medications, name of antihypertensive medications, and past medical history is high. Additionally, the administered survey consists of a battery of validated questionnaires that requires a completion time of at least twenty-five minutes. Hence, it places a significant cognitive burden on the respondents particularly with this mode of administration in which the respondents has to read, comprehend, recall, and then answer the requested information (Bowling, 2005). Further, the willingness of the respondents to disclose some information, which is believed to be sensitive from their own perspective is a common limitation in survey research (Bowling, 2005). For instance, many of the respondents refused to answer the question about their estimated annual income even after explaining the purpose of this research as well as the anonymity and confidentiality of their responses. Thus, we have not controlled for older adults' annual income in our analyses.

The general domain of the Beliefs about Medicines Questionnaire (BMQ) was used to assess participants' beliefs about medications. Although, research has confirmed a significant association between the general domain of the BMQ and medication adherence in general, the specific domain of the BMQ was not included (Horne & Weinman, 1999; Sjölander, Eriksson, & Glader, 2013). Among hypertensive participants in this study, the general domain of the BMQ has failed to show a consistent association with the medication adherence contrary to the specific domain of the BMQ, which consistently showed a significant association with medication adherence among this patient population (Gatti et al., 2009; Rajpura & Nayak, 2014). In addition, health literacy was assessed using a single screening question (Chew et al., 2004). Although, this single health literacy-screening question has been validated using both the Test of Functional Health Literacy in Adults (TOFHLA) and the Rapid Estimate of Adult Literacy in Medicine (REALM) as reference standards, it is not as accurate as these two standard tests of health literacy (Wallace et al., 2006).

The utilization of path analyses to examine the relationship between the participants' views of online medication rating websites (i.e., PROMEX) and the participant-reported

outcomes (i.e., participant satisfaction with communication, quality of life, beliefs about medications, and medication adherence) has several advantages over multiple regressions analyses. First, path analysis involves a series of multiple regressions rather than one regression. Second, in multiple regression analysis, the relationship between only one dependent variable and several independent variables is analyzed; however, no relations between the independent variables are analyzed. Nevertheless, in path analysis the relationships between the independent variables are analyzed. Therefore, the path analysis enables researchers to disentangle complex relationships between multiple variables (Streiner, 2005). Further, several hypotheses can be tested by examining both the causal (i.e., direct and indirect effects) on as well as the non-causal effects on the dependent variables (Lleras, 2005; Nazim & Ahmad). However, the path analysis is not limitation-free. The path analysis follows the same theoretical assumptions of the multiple regression analyses. Further, the causality in the hypothesized path model is recursive (i.e., flows in one direction). Additionally, the path model has to assume that each measured variable is free of measurement errors. These assumptions are difficult to meet in social research (Lleras, 2005). Moreover, the path model in this study could not explain more than 6% at best of the variance in participants' views of online medication rating websites (i.e., PROMEX). Furthermore, the sample size was another limitation of this study. Although, the minimum sample size required for a medium effect size at a power=0.80 and α=0.05 was satisfied, the sample size was not large enough to detect small sized effects. The sample size of our study is 286, however, the sample size required for a power of 0.8 and a small effect size is 757 (J. Cohen, 1992). Finally, this is a cross-sectional study where causality cannot be ascertained between HRQoL and participants' views of online medication rating websites as an example; however, we clearly can say that there is a significant association between the two that needs to be further investigated in better-designed studies such as cohort studies.

5.6   Conclusions

In summary, older adults from seven senior centers were surveyed about the usefulness of the online medication rating websites in facilitating the communication with their physicians using a newly developed questionnaire. Participants with poor HRQoL viewed the online medication rating websites more favorably compared to their counterparts with good HRQoL. Further, participants with multiple chronic conditions had favorable views of the online medication rating websites. Therefore, participants who are more likely to take prescription medications favorably viewed the online medication rating websites. Moreover, older adults with limited health literacy were more likely to view the online medication rating websites more favorably than older adults with good health literacy level. Moreover, we have found that participants' satisfaction with their antihypertensive medication regimens was associated with positive participant-reported outcomes (i.e., higher physical HRQoL scores, positive beliefs about medications, higher satisfaction with physician communication, and better medication adherence).

Older adults' satisfaction with physician communication was associated with higher HRQoL, better medication adherence, positive beliefs about medications, and higher

overall rating of antihypertensive medication regimens. Thus, participants with poor HRQoL, who were more likely to view the online medication rating websites more favorably compared to their counterparts with good of quality of life, were more likely as well to have a low level of satisfaction with their physicians' communication. Further, since older adults with poor HRQoL were more likely to have both lower education and health literacy, the availability of accessible online health information portrayed in a visual and easy to understand language such as the online patient reviews of medications may enhance the physician-patient communication, and result in favorable outcomes.

In addition, many older adults feel that their role is marginal in the decision-making process. Therefore, many of them expressed their desire to become active partners in the health decision-making process together with their physicians (Gladden, 2000). In this study, participants who liked to share their health decision with their physicians, were more likely to view the online medication rating websites more favorably than their counterparts, who liked to either keep their health decision in their own hands or leave it to their physicians. Thus, online patient reviews of medications could play a beneficial role by empowering older adults to participate actively in decisions related to their health care.

Nonetheless, some studies have questioned the integrity of the online health information as they frequently contain inaccurate and sometimes misleading information (Erdem & Harrison-Walker, 2006). Furthermore, the online health information may strain the physician-patient relationship especially when patients think that they know more than their physicians or when they ask for a prescription medication and their physicians refuse to prescribe it due to valid and clinically sound reasons. Physicians' concerns about the harmful effects of the online health information on the relationship with their patients, stems from the fact that they need to spend more time answering and addressing patients' questions and requests especially if the information that the patients encountered online was incorrect or inaccurate (Anderson, Rainey, & Eysenbach, 2003; Erdem & Harrison-Walker, 2006). However, most elderly patients like to receive more information from their physicians. In addition, elderly patients tend to turn to their physicians as the primary source of health information (Campbell & Nolfi, 2005). Further, research has shown that each additional minute spent by physicians with their patients during their visits is associated with an improvement in patient trust (Fiscella et al., 2004). Therefore, physicians' concern over the possibility of the online health information to have a negative impact on the relationship with their patients might be overstated.

Elderly patients are more likely to experience adverse drug events due to their diminished physiological reserve (Wasson, 2008). Further, elderly patients are underrepresented in most clinical trials that were conducted for the approvals of many currently available and widely used drugs (Konrat et al., 2012). Therefore, the creation of secure online patient portals by well-known health organizations (i.e., Centers for Medicare and Medicaid Services, academic health institutions, Food and Drug Administration), where actual patients can share their prescription medication experiences with others anonymously, may help in monitoring adverse drug reactions among patients in general and the elderly ones in particular. Moreover, the clinical

guidelines that are used in the treatment of elderly patients with multiple comorbidities have proven ineffective in managing the health conditions of this important segment of the patient population (Boyd et al., 2005). Besides the potential role of the online patient reviews of medications in the adverse events reporting and post-marketing surveillance, they may also help physicians and researchers alike in reviewing the current treatment guidelines for elderly patients. Therefore, the roles that online medication-rating websites may play in the future might not be limited to enhancing the physician-patient communication.

Finally, although the findings of this study suggest that online patient reviews of medications may positively influence the patient-physician communication particularly among older adults with poor HRQoL, multiple health conditions, lower educations, and limited health literacy, the results of this study should be interpreted cautiously due to the aforementioned limitations. Future research should examine the impact of the online patient reviews of medications as an intervention on physician-patient communication, and consequently on other participant-reported outcomes.

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APPENDIX A. QUESTIONNAIRES AND COPYRIGHT PERMISSIONS

BELIEFS ABOUT MEDICINES QUESTIONNAIRE (BMQ) PERMISSION

Conditions for Translation and Usage of the
Beliefs about Medicines Questionnaire (BMQ)

1. The copyright of the translated BMQ and all adaptations remains with the Originator (Professor Rob Horne). (NOTE: subsequent permission to use the translated questionnaire must be agreed by him).

2. The translated BMQ is used ethically

3. The BMQ is translated and used completely intact. Items or phrases may not be removed or used in other contexts.

4. The back-translation of the BMQ is approved by Professor Horne

5. All copies of the BMQ will have the legend: '© Professor Rob Horne' clearly indicated on them.

6. The BMQ is analysed and reported in accordance with the instructions of the Originator

7. The BMQ may not be used in studies developing other assessment tools without specific permission of the originator

8. A copy of the translated questionnaire is submitted to Prof Horne.

Publication rights of the BMQ

1. The BMQ itself may not be published except by its constructors.

2. Permitted users are free to publish BMQ scale scores without collaborating with the Originator

3. Publications, which include psychometric data of the BMQ, should include Professor Horne as a co-author.

I agree to the above conditions for translation of the BMQ:

Name of user	Song Ha Hong
Signature of user	Song Ha Hong
Address for correspondence	881 Madison, #219 Memphis, TN 38163
E-mail	shhong@uthsc.edu
Telephone	901-448-5170
Date	Jun 7, 2013

BMQ CONDITIONS for translation and usage form RH 0611.docx

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PRIMARY CARE ASSESSMENT SURVEY (PCAS) PERMISSION

Reply   Reply All   Forward

RE: Primary care assessment survey

Li, Angela [Angela.Li@bcbsma.com]

To: yalruthi

Attachments: (2)   Download all attachments

PCAS Survey.zip (110 KB);   PCAS Scoring.zip (30 KB)

Monday, October 01, 2012 11:54 AM

You forwarded this message on 12/8/2012 8:35 PM.

Hello,

My apologies – we have been having problems with the online request form.

Thank you for your interest in the Primary Care Assessment Survey. I have attached two zip files for you to use. The first contains copies of the PCAS (long form and short form), a domains document that indicates which items are used in the various scales, and an up-to-date publication listing that cites work from the PCAS. The second zip file contains scoring information for the PCAS as well as a sample dataset for you to use.

Please let me know if you have any questions or concerns.

Best of luck with your research.

Thanks,
Angela Li

From: yalruthi [mailto:yalruthi@uthsc.edu]
Sent: Monday, October 01, 2012 12:48 PM
To: Li, Angela
Subject: Primary care assessment survey

Greetings Ms.Angela,

Hope this Email finds you in your best health. Actually, I just need a small favor from you. I have submitted a request through Tuft clinical research and health policy institute a month ago to get a copy of the PRIMARY CARE ASSESSMENT SURVEY (PCAS), but unfortunately I did not receive anything so far. Today, I have made another request and I am hopeful that I will receive a copy. Would you please Email me a copy of the PCAS?

Thank you very much :) attached is copy of the request that I submitted today.

Sincerely,

Yazed Al-Ruthia, B.Sc.Pharm, PharmD
Doctoral Student, Health Outcomes and Policy Research
The University of Tennessee Health Science Center
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SHORT FORM HEALTH SURVEY (SF-12V2) PERMISSION

From: Pam Bartley [mailto:pbartley@qualitymetric.com]
Sent: Thursday, May 23, 2013 10:31 AM
To: Hong, Song Hee
Cc: Pam Bartley
Subject: QualityMetric Health Outcomes(tm) Scoring Software 4.5 Activation Key - University of Tennessee Health Science Center - QM017085

Dear Yazed Sulaiman Alruthia,

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PURCHASE DATE: 05/22/13

SF12v2 Credit Count: 400
    SF12v2 MDE Enabled: Yes
    SF12v2 Utility Index: No
    SF12v2 DQE Report: Yes

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IMPORTANT NOTES - PLEASE READ
Important installation notes are provided below. More detailed instructions are included in the attached. If you are prohibited from installing software or do not feel comfortable doing so, please consult your IT support and bring the items below to their attention:

MORISKY MEDICATION ADHERENCE SCALE (MMAS-8) PERMISSION

License Agreement for use of the Morisky Medication Adherence Intellectual Property

In consideration for the right to use certain Morisky proprietary psychometric tools and intellectual property, the undersigned researcher (hereunder "Licensee" or "you") agrees to the following:

A. Ownership and Fees: All psychometric products as well as their translations, adaptations, computer programs, and scoring algorithms, trade secrets, and any other related documents and information (including those in electronic form) which embody or are related to the MMAS tools (including without limitation the Morisky Medication Adherence Scale 4- and 8-item versions, 4-item Morisky Adherence Questionnaire, and any documentation thereof) are intellectual property of Donald E. Morisky, ScD, ScM, MSPH. ("Owner") Professor of Community Health Sciences, UCLA Fielding School of Public Health, Los Angeles, CA 90095-1772 (the address for all payments and communications related to this agreement). The license fee is $0.35 per administration for each patient, payable in advance (fee waiver available for students and those conducting publicly funded adherence research).

B. Translations: Permission will only be granted to translate the MMAS tools subject to the following requirements: all translations must be made by contracting with the MAPI Institute and final translations must be approved by the Owner. Languages that have already been translated and validated by the MAPI Institute can be requested through the MAPI Trust (notes: the MAPI Institute employs the most rigorous standards in the translation process using two native linguistic experts to independently conduct forward and backwards translation; the Owner is generally involved in validating each item in the scale and grants use of the translated scale through a separate license agreement; those wishing to produce a translation should contact the Owner for further details).

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I understand that the licensure fee for use of the copyrighted MMAS-8 will be waived, as I am a doctoral student conducting adherence research with no private funding source. If this situation should change to private sources of funding, then the license is no longer in effect. The license agreement is in effect for a one-year period or the duration of the study, whichever is shorter. If your study is longer than one year, a renewal of license is available based upon a brief status report. I agree with the specification outlined above regarding the use of the Morisky Medication Adherence Scale, 8-Items, MMAS-8 and will abide with its requirements. I agree to provide results of my research to Professor Morisky upon completion of this study. Please fax or scan and email to: *Donald E. Morisky, ScD, ScM, MSPH, Professor, Department of Community Health Sciences, UCLA Fielding School of Public Health, 650 Charles E. Young Drive South, Los Angeles, CA 90095-1772. fax 310-794-1805 or email to dmorisky@ucla.edu.*

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Title of Research:

The Value of Patients' Ratings & Reviews of Prescribed Medicines

Signature of researchers:

Dr.Hong (My adviser): _Songha Hong_

Yazed Alruthia: _____

Date:___12/12/2012_____

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UT Memphis

Fax

To:	Donald Morisky	**From:**	Cynthia Crowe
Fax:	310-794-1805	**Pages:**	3 (including cover)
Phone:		**Date:**	December 17, 2012
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City:	Memphis
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APPENDIX B. INSTITUTIONAL REVIEW BOARD DOCUMENTS

UT IRB APPROVAL

THE UNIVERSITY OF TENNESSEE
Health Science Center

Institutional Review Board
910 Madison Avenue, Suite 600
Memphis, TN 38163
Tel: (901) 448-4824

April 15, 2013

Song Hee Hong, Ph.D.
UTHSC - COP - Clinical Pharmacy
219 Pharmacy Building

Re: 13-02442-XM
Study Title: The Value of Patient Reviews of Medication Experiences (PROMEX)

Dear Dr. Hong:

The Administrative Section of the UTHSC Institutional Review Board (IRB) has received your written acceptance of and/or response dated April 10, 2013 to the provisos outlined in our correspondence of March 22, 2013 concerning the application for the above referenced project.

The IRB determined that your application is eligible for **exempt** review under 45CFR46.101(b)(2) in that the study/project involves eligible research using educational tests, surveys, interview procedures, or observation of public behavior. In accord with 45 CFR 46.116(d), informed consent may be altered with the cover statement used in lieu of an informed consent interview. The requirement to secure a signed consent form is waived under 45 CFR 46.117(c)(2). Willingness of the subject to participate will constitute adequate documentation of consent. Your application has been determined to comply with proper consideration for the rights and welfare of human subjects and the regulatory requirements for the protection of human subjects. Therefore, this letter constitutes full approval of your application (version 1.1), consent cover statement and survey [stamped approved by the IRB on April 15, 2013] for the above referenced study.

This study may not be initiated until you receive approval from the institution(s) where the research is being conducted.

In the event that volunteers are to be recruited using solicitation materials, such as brochures, posters, web-based advertisements, etc., these materials must receive prior approval of the IRB.

Any alterations (**revisions**) in the protocol, consent cover statement, or survey must be promptly submitted to and approved by the UTHSC Institutional Review Board prior to implementation of these revisions. In addition, you are responsible for reporting any unanticipated serious adverse events or other problems involving risks to subjects or others in the manner required by the local IRB policy.

Sincerely,

Signature applied by Donna L Stallings on 04/15/2013 01:20:05 PM CDT

Signature applied by Terrence F Ackerman on 04/15/2013 01:22:00 PM CDT

Donna Stallings, CIM   Terrence F. Ackerman, Ph.D.

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STUDY COVER LETTER (CONSENT FORM)

Patient Reviews of Medication Experience (PROMEX)

You, the patient, achieve the best health outcomes when you are involved in the treatment decision making process. You are more motivated to adhere to medication treatment when your physician considers your experiences and preferences while making the treatment decision. Thus, we would like to know what it has been like for you to take your medications.

First, we will ask you how valuable patient reviews of prescribed medicines (PROMEX) would be, if available. We will then ask you about your beliefs about prescribed medicines, as well as your experience of communicating with your doctor. If you have high blood pressure, we will further ask you to provide a review based on your own experience of taking each high blood pressure medication. The information you provide will help health care providers receive feedback on medication therapy decisions. It will facilitate communication between you and your prescribers about the best medication therapy options that work for you.

We are visiting senior centers in and around the Memphis area to invite people like you to participate in the survey, because as a senior, you are most likely to have taken a prescribed medicine, especially for high blood pressure. The survey will take approximately 25 minutes to complete. If you have any questions or concerns about the survey, we encourage you to talk to one of our research assistants. As a token of our appreciation, you will receive a $20 Kroger gift card for completing the survey.

The survey does not involve any physical risks. However, at times, you may be tired after answering a series of questions. If that is the case, we absolutely encourage you to take a break for a couple of minutes, and then come back and finish the rest of the survey. Through your participation in this study, you will become aware of current trends of patient care as well as different drug therapy options for high blood pressure. **Your participation in this study is absolutely voluntary**. You have the right to stop answering questions at any time and withdraw from this study with no penalty or loss of rights to which you are entitled.

In order to keep your responses confidential, we will not ask for your name during the survey. Your record will be labeled with a code number. Hard copies of surveys will be kept in a secure place. If you have any questions about the research, you may contact Song Hee Hong, PhD at 901-448-5140 (daytime M-F) or 901-850-8416 (nights & weekends). If you have any questions about your rights as a research subject or concerning a research related injury, you can contact Dr. Terrence F. Ackerman, Ph.D., UTHSC IRB Chairman at 901-448-4824.

Sincerely,

Yazed Al-Ruthia, PharmD, PhD student

Song Hee Hong, Ph.D., Associate Professor
College of Pharmacy
University of Tennessee Health Science Center

VITA

Yazed Sulaiman AlRuthia was born in Riyadh, Saudi Arabia in 1983. He completed his bachelor degree in pharmaceutical sciences from King Saud University in Riyadh, Saudi Arabia, in 2007. After receiving his degree, he worked as a teaching assistant in the college of pharmacy at King Saud University from year 2007-2008. In fall 2008, he received a scholarship from the Saudi Arabian ministry of higher education to pursue his doctor of pharmacy from Massachusetts College of Pharmacy and Health sciences in Worcester, MA. In May 2011, he completed his doctor of pharmacy degree and joined the PhD program at the University of Tennessee (Major: Health Outcomes and Policy Research).