PROJECT PROMISE: PERSPECTIVES ON MEDICATION INFORMATION SEEKING IN THE ELDERLY

by

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To my fiancé Katie, who makes everything worth it

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"It always seems impossible until it's done."- Nelson Mandela

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ABSTRACT

Background/ Objective: In our current healthcare system, information seekers have a bulk of the responsibility to initiate conversations about medications. Although older adults report the need for more information about their medications, many do not accept offers to receive more information from pharmacists during the dispensing of prescription medications. Very little previous work focuses on how older adults make decisions about seeking and avoiding information about medicines, or how these decisions impact medication outcomes. Therefore, the specific aims of this study were to: 1) describe older adults' attitudes about medication information seeking and the relationships between those attitudes and medication information management behaviors and 2) characterize the relationship between medication information management behaviors (MIMB), medication knowledge, medication beliefs, and attitudes towards medication information seeking.

Methods: Older adults prescribed a new, chronic medication were recruited from a specialty geriatric clinic to participate in interviews that occurred either in-person or over the phone. Participates were randomized 1:1 to usual care or to patient-prompted medication counseling (PPMC). Participants in the PPMC group agreed to ask a pharmacist questions about their new medication at their next medication refill and received a brief education. A survey instrument based on the Theory of Motivated Information Management (TMIM) was adapted from past studies to assess participants' attitudes about information seeking. Participants were asked to report their information seeking and avoidance over the previous six-months prior to the study and at baseline and month one. Open-ended questions from a national medication safety campaign were utilized to assess medication knowledge. A rubric was developed to score participants' answers as incorrect knowledge, no knowledge, incomplete knowledge, or complete knowledge and used by two community pharmacists to determine patient medication knowledge (PMK) scores. Structural equation modeling was utilized to identify predictors of MIMB, and hierarchical and logistic regression were used to determine the relationship between MIMB and medication outcomes.

Results: A total of 132 participants completed baseline surveys, and 126 participants completed the month one surveys. Overall, a structural model based on the TMIM met the a priori criteria for good fit (Bollen-Stine bootstrap=0.269). Participants' positive outcomes

assessments, negative outcomes assessments were direct, positive predictors of information seeking and direct, negative predictors of information avoidance. After controlling for baseline medication knowledge, the effect of the intervention, and information seeking there were statistically significant differences in medication knowledge between those participants that sought information from a pharmacist during refill dispensing and those who did not ($B=0.259$, $p<0.001$). Of those that sought information from a pharmacist, 70% gained information from baseline to month one, while 36.9% of those that did not seek information from a pharmacist gained information baseline to month. There were no differences in medication beliefs between those that sought information from a pharmacist and those that did not.

Discussion/ Conclusion: Patient knowledge deficits continue well beyond the initial dispensing of a medication, and older adults are also at risk for knowledge loss over the course of prescription use. Receiving additional information from a pharmacist at the time of medication refill may be protective against this information loss, and even increase the change of gaining medication knowledge over time. However, medication counseling in its current form is likely not sufficient to alter older adults' beliefs about medications. Only one pharmacist initiated a conversation with a participant at medication refill indicating that those participants who want additional information about their medications after the initial dispensing may have to initiate the conversation with a pharmacist.

CHAPTER 1. INTRODUCTION

1.1 Overview

The elderly population (typically defined as those over 65 years of age) account for a disproportional amount of all medication use and have an increased risk for serious drug-related problems (*Institute of Medicine*, 2004). With complex medication regimens and an increased risk of adverse effects, elderly adults are often not properly equipped with the necessary medication information to safely and effectively use their medications (Barat et al., 2001; Burge et al., 2005; Granås & Bates, 2005; Jaye et al., 2002). Older adults are more likely to rely on healthcare providers to provide medication information, than any other potential informational source (Donohue et al., 2009). Meanwhile, evidence suggests that healthcare providers provide less information to their elderly patients than any other age group (Abaurre-Labrador et al., 2016; Harris et al., 2002a).

Providers are likely to overestimate the quality and quantity of provided communication, while underestimating the amount of information that patients want and need (Auyeung et al., 2011a). Patients desire substantially more information than healthcare providers believe they want and need (Nair et al., 2002; Raynor et al., 2004). As a result, patients often have the bulk of responsibility to seek information for themselves.

The dispensing of prescription medications in community pharmacies often serves as the final "teachable medicine moment," before a patient starts taking a newly prescribed medication. Pharmacists are important sources of medication information for elderly patients, due to their medication expertise and accessibility to patients (Geest & Sabaté, 2003). While a majority of patients report they need and want information about new medications, many do not accept offers to receive medication information from pharmacists at the time of medication dispensing (Krueger & Hermansen-Kobulnicky, 2011).

Information avoidance, or the intentional choice to not obtain information even when information is needed or desired, during medication dispensing has the potential to impact a variety of patient outcomes, considering 39% of older adults are unable to read the information given on prescription labels, and 67% are unable to fully understand the information (Moisan et al., 2002). Lack of information exchange between healthcare providers and patients regarding their

medications has implications not only for patient safety, but also for medication adherence (i.e. the degree to which patients take medications as prescribed) (*National Council on Patient Information and Education*, 2017). Medication nonadherence, which is known as "America's other drug problem," has a myriad of negative effects from avertable disease progression to increased chance of preventable death (*National Council on Patient Information and Education*, 2017). Patients who are uninformed about their medications may lack an understanding of their medications' purposes, benefits, and side effects. These types of knowledge deficits and negative beliefs about prescription therapies have been identified as primary reasons that patients choose to be nonadherent (*National Council on Patient Information and Education*, 2017).

1.2 Statement of the Problem

Over eighty percent of older adults have at least one chronic condition, and sixty percent of older adults manage multiple chronic conditions (Ward, 2012). The most common chronic diseases in the elderly population include heart disease, cancer, stroke, and diabetes (*Department of Health and Human Service*, 2010). These chronic diseases represent the leading causes of morbidity and mortality in the elderly population, as well as increasing health care costs in this population (Lubitz, 2003).

In a healthcare environment where elderly patients are managing multiple medications, disease states, and healthcare providers, they are forced to become key players in advocating for the safe and effective use of their own medications (Britten, 2009). In a nationally representative sample of older adults in the United States, 38.1% used multiple pharmacies (Marcum, 2014). In another national sample of 7,933 Veterans over the age of 65, 30% had two prescribers, 11% had three prescribers, and another 6% had four or more prescribers (Maciejewski, 2014). Increased numbers of medical personnel involved in a patient's disease state management and the complexity of treatment elevate the need to understand how elderly patients manage their medication information needs. Specifically, a clearer understanding of why patients regularly refuse offers to receive medication information is needed, especially when they indicate needing and wanting the information they are refusing (Krueger & Hermansen-Kobulnicky, 2011).

Ninety-three percent of Americans over the age of 65 live at least semi-independently in community-based settings, and over half of these older adults continue to manage their own medications (Aging-Related Statistics, 2008). Common problems in medication management

include patients' inability to read and understand health information, difficulty opening medication packaging, inability to swallow or administer medications, forgetting to take medication, and improper storage of drugs (Kairuz et al., 2008; Mira et al., 2014, 2015; Roth & Ivey, 2005). While older adults aren't necessarily more likely to be nonadherent to medications, they are at greater risk for negative outcomes of nonadherence such as hospitalization, morbidity, and mortality (Marcum, 2017). Ultimately, more research is needed about how patients' decisions to seek or avoid medication information impact medication outcomes. Medication adherence is a complex issue which requires multiple types of solutions, but communication between health care providers and patients has been identified as an important target for medication adherence-related interventions. More research is needed to understand how patient education and communication influence medication adherence. Medication knowledge and medication beliefs may be particularly useful intermediate outcomes to evaluate due to their previous correlation with medication adherence in older adult populations (Sweileh, 2014). Increasing communication between healthcare providers and patients about medications may help address knowledge deficits or specific concerns that patients have about medications, ultimately leading to improvements in medication adherence. Project PROMISE aims to be the first study to longitudinally assess the predictors and outcomes of medication information management behaviors (MIMB), or the use of specific strategies to manage medication information needs, in an elderly population using chronic medications.

1.3 Theoretical Background

Historically, theoretical literature on information seeking was centered on the idea that "all men, by nature, desire to know." The suggestion that people often avoid information has seldom been discussed (Case et al., 2005). However, ignorance alone does not always encourage individuals to engage in information seeking behaviors (Case et al., 2005). More recent models have distinguished between actual knowledge level and desire for information by allowing for information avoidance (Afifi & Afifi, 2009).

Information avoidance by patients is evident in the current practice models of many community pharmacies. In 1990, the Omnibus Budget Reconciliation Act began requiring counseling on new prescription medications for patients enrolled in Medicaid. Many states followed its enactment with laws of their own, requiring face-to-face counseling on new

prescriptions for all patients or alternatively an offer to counsel (Kimberlin, Jamison, Linden, & Winterstein, 2011). Even with these regulations, common practice indicates pharmacy counseling occurs at surprisingly low rates in community pharmacies (Hanni Prihhastuti Puspitasari B Sc, Parisa Aslani, Hons M Sc, 2009). Many times lack of counseling is attributed to lack of patient interest, but a recent study reports that over 90% of patients want information about their new prescriptions from a pharmacist at the time of dispensing (Hermansen-Kobulnicky, 2011). Even so, a majority of patients routinely turn down offers at the pharmacy counter to answer questions or give more information (Krueger & Hermansen-Kobulnicky, 2011).

The theory of motivated information management (TMIM) (Afifi & Weiner, 2004) incorporates intentional information avoidance by individuals. This theory is unique from other information seeking theories because: 1) it relates specifically to interpersonal information seeking, 2) it allows for the influence of both the information seeker and the information provider, and 3) it includes mediators between the desire for information and actual information seeking behaviors. These characteristics make the TMIM applicable for describing medication information exchange between pharmacists and patients, in that patients may avoid medication information that they want or need to know.

The TMIM describes the internal mechanisms by which people choose to seek or avoid information through constructs such as: uncertainty discrepancy, anxiety, outcome assessments, and efficacy (see Table 1.1) (Afifi & Weiner, 2004). Figure 1.1 provides a visual representation of TMIM. While this theory has shown utility in other health communication contexts, it has yet to be specifically applied to the information exchange between older adults and community pharmacists during medication dispensing.

Table 1.1. TMIM Construct Definitions

Construct	Construct Definition[1]
Uncertainty discrepancy	the difference between how much an individual desires to know and actually knows about a topic
Anxiety	the emotional response related to uncertainty
Outcome assessments	the expected outcomes of information seeking (combination of positive outcome expectancies and negative outcome expectancies)
Positive outcome expectancies	the positive potential outcomes of information seeking
Negative outcome expectancies	the negative potential outcomes of information seeking
Efficacy assessments	the extent to which individuals perceive themselves as able to successfully seek information (combination of communication efficacy, coping efficacy, and target efficacy)
Communication efficacy	the extent to which an individual feels able to communicate with the target (i.e. information provider)
Coping efficacy	the extent to which individuals have the resources to use information given to them and deal with negative potential outcomes of information seeking
Target efficacy	the extent to which individuals perceive the target (i.e information provider) as willing and able to communicate the information to the seeker
Medication information management behaviors	the use of specific strategies to manage medication information needs including direct information seeking, indirect information seeking, information avoidance, and cognitive reappraisal

[1]Definitions adapted from Afifi, W. A., & Weiner, J. L. (2004). Toward a theory of motivated information management. Communication theory, 14(2), 167-190.

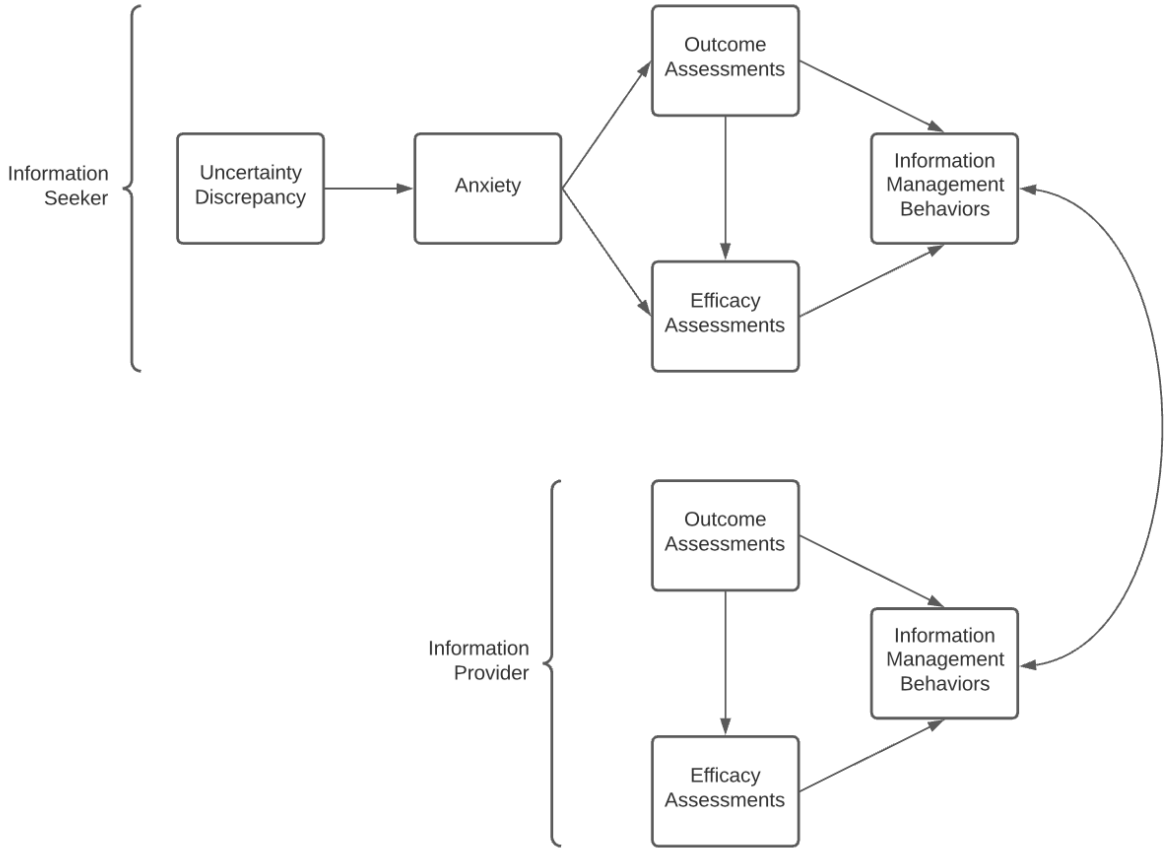

Figure 1.1. The Theory of Motivated Information Management

Information seekers (i.e. patients) will be the focus of this study. The TMIM also has potential utility in describing behaviors of information providers (i.e. pharmacists). However, there is a greater need for patient perspectives of information seeking due to the environment of current community pharmacy practice settings. In community pharmacies, pharmacists are not required to provide counseling, but instead only required to offer counseling. The responsibility to accept these offers or seek medication information is primarily placed on patients, the information seekers. The TMIM suggests that individuals make decisions about seeking information in response to anxiety related to a discrepancy in how much information a person has and how much information a person desires. Individuals may choose to seek information (directly or indirectly), avoid information, or simply cognitively reappraise the need for information to decrease their anxiety.

Individuals have expectations about the potential outcomes of seeking information, and weigh these outcomes based on the importance and probability of each of these outcomes occurring. Efficacy assessments are an individual's perceptions about the extent to which he or she is able to communicate with the information provider and ultimately use the information that the information provider offers. Efficacy assessments also include an individual's perceptions about how willing and able the information provider is to offer the needed information. Ultimately, these assessments and expectations about the potential results of information seeking explain why patients choose to seek or avoid medication information.

In previous research, patients have displayed concern about the adverse effects and addictive potential of medications, and they express a need for more information about their prescriptions (Krueger & Hermansen-Kobulnicky, 2011; Schüz et al., 2011a). However, they frequently decline opportunities to receive medication information in community pharmacy settings (Krueger & Hermansen-Kobulnicky, 2011). The TMIM will be used to explore the mediating factors (outcome expectations and efficacy assessments) that may play a role in patients' information seeking and avoidance. The TMIM also accounts for the patient's perception of pharmacists as information providers, which may explain why patients specifically seek or avoid information in the community pharmacy setting.

1.4 Significance of the Study

Lack of information exchange between healthcare providers and patients has many potential negative impacts on individual patients, healthcare providers, and the healthcare system, as a whole. It is estimated that 20% - 30% of prescriptions are never filled by patients, and over half of all prescriptions filled in the United States are not taken as prescribed (Kripalani et al., 2007; Osterberg & Blaschke, 2005). The costs of medical nonadherence account for 125,000 lives and over 100 billion dollars per year in the United States alone (Bosworth et al., 2011). The reasons for lack of adherence are numerous, with communication between patients and healthcare providers acting as a key factor (Bosworth et al., 2011).

There is a communication gap between healthcare providers and patients in need of medication information (Grymonpre & Steele, 1998; D. H. Smith et al., 2009; Wilson et al., 2007). For the elderly population, the potential negative impacts on health outcomes due to this gap are greater than their younger counterparts (Mira et al., 2015; Takane et al., 2013). Wilson points to

the urgent need to bridge this gap and summarizes the current literature on elderly medication use by saying that current research findings, "… paint a sobering picture of prescription medication taking for America's seniors. Most seniors have multiple chronic diseases, take multiple prescription medications, have more than one prescribing physician, and use multiple pharmacies. In these circumstances the need for improved...communication about medications is pressing (Wilson et al., 2007)." Evidence over the last decade suggests little has changed to address this persistent issue. The proposed study will use a patient-centric approach to assess the MIMB of older adults, and ultimately aim to increase medication knowledge by requesting that patients initiate information seeking during the dispensing of a chronic medication.

1.5 Specific Aims and Hypotheses

This study will use the TMIM to explore medication information seeking in older adults. This study will longitudinally follow older adults through one month of using a new chronic medication, focusing on medication information management behaviors (MIMB).

1.5.1 Specific Aim One

Describe older adults' attitudes about medication information seeking and the relationships between those attitudes and medication information management behaviors (see Figure 1.2).

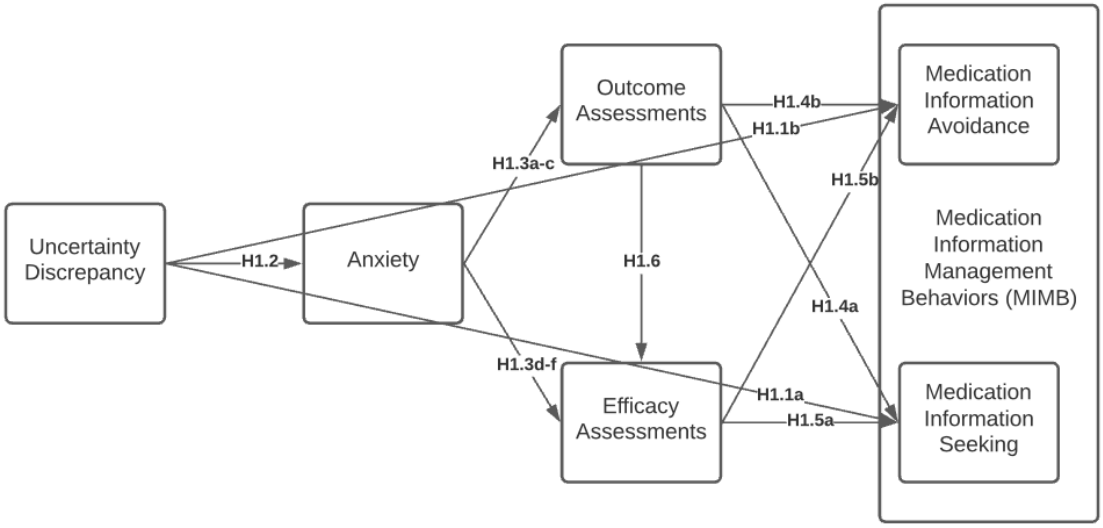

Figure 1.2. Specific Aim One and Associated Hypotheses

Hypotheses for Aim One

Hypothesis 1.1: The magnitude of discrepancy between older adults' current perceived level of uncertainty about medications and their desired level of uncertainty about medications (uncertainty discrepancy) will be positively correlated with medication information-seeking behaviors and negatively correlated with information avoidance.

Hypothesis 1.2: The magnitude of older adults' uncertainty discrepancy will be positively correlated with anxiety about that perceived uncertainty.

Hypothesis 1.3: The intensity of older adults' anxiety about their uncertainty about medications will be negatively correlated with their outcome and efficacy assessments.

Hypothesis 1.4: A linear combination of outcome assessments and coping efficacy will be positively correlated with active medication information-seeking and negatively correlated with avoidance.

Hypothesis 1.5: A linear combination of communication efficacy and target efficacy will be positively correlated with active medication information-seeking and negatively correlated with avoidance.

Hypothesis 1.6: Older adults' outcome assessments will be positively correlated with their efficacy assessments.

Hypothesis 1.7: Older adult's efficacy assessments (communication efficacy and target efficacy) will mediate the association between anxiety about uncertainty discrepancy and medication information-seeking behaviors.

1.5.2 Specific Aim Two

Characterize the relationship between medication information management behaviors (MIMB), medication knowledge, medication beliefs, and attitudes towards medication information seeking (see Figure 1.3).

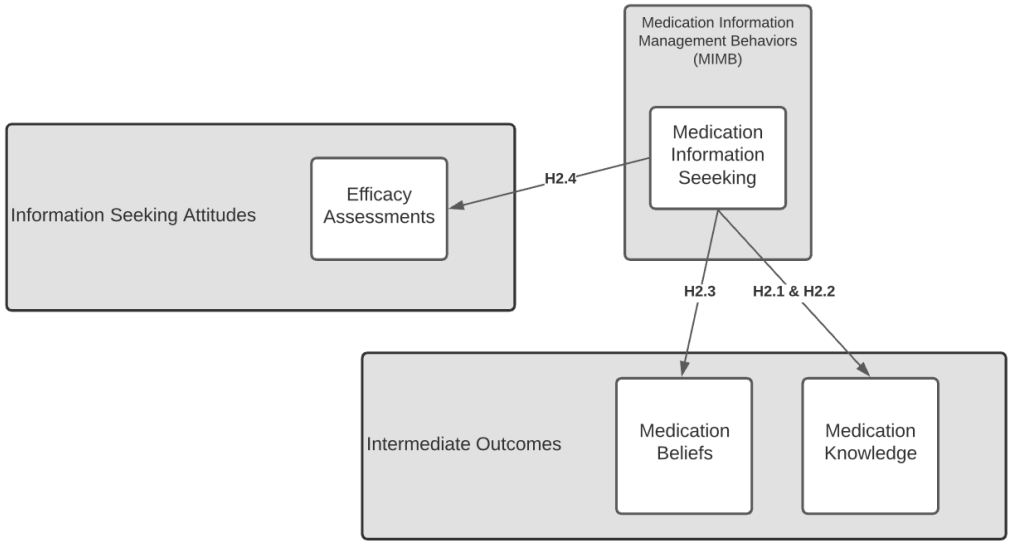

Figure 1.3. Specific Aim Two and Associated Hypotheses

Hypotheses for Specific Aim Two

Hypotheses 2.1 Older adults who seek medication information at the time of dispensing will have higher levels of medication knowledge at the end of the study period when compared to those participants who do not seek medication information.

Hypothesis 2.2 Participants who seek medication information at the time of dispensing will have more persistent information recall, when compared to those participants who do not seek medication information.

Hypothesis 2.3 Participants who seek medication information at the time of dispensing will have higher necessity beliefs and lower concern beliefs about their medication, when compared to those participants who did not seek medication information.

Hypothesis 2.4 Participants who seek medication information at the time of dispensing will have higher communication and target efficacy scores for pharmacists at the end of the study period, when compared to those participants who do not seek medication information.

1.6 Notes

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CHAPTER 2. LITERATURE REVIEW

This review will describe the literature regarding information seeking and medication outcomes in older adults. Medication outcomes will be reviewed in following sections: (1) medication knowledge and (2) medication beliefs. The scope of the outcomes section of this review is adults over the age of 65 or studies that specifically stated the sample was limited to "older adults," "elderly," "aged" or "aging." First, the existing literature measuring medication knowledge will be summarized, including a discussion of previous attempts to conceptualize and measure medication knowledge. A summary of the literature measuring medication beliefs will follow, including the exploration of the relationship between medication beliefs and medication adherence.

The medication information seeking portion of the review starts with a brief review of studies focused on medication information management behaviors (MIMB) during medication use and will be separated into the following sections: (1) MIMB during prescribing, (2) MIMB during dispensing, and (3) MIMB during administration and monitoring. In the first two sections, past literature focusing on physician-patient communication related to medications during prescribing and pharmacist-patient communication during dispensing will be explored. The third section will summarize previous work describing patient information-seeking from a variety of sources during medication administration and monitoring. Finally, the utility of the theory of motivated information management (TMIM) in the context of MIMB will be explored including a summary of past studies utilizing TMIM in health contexts. The chapter will conclude with a summary and description of the conceptual model utilized as a basis for the design of the study.

2.1 Medication Outcomes in Older Adults

Age is an independent risk factor for disease burden, which often results in the greater use of medications (Sloan, 1992). Nearly 90% of community-dwelling adults 55-85 years old, are taking at least one prescription medication, and over one-third (35.8%) are taking more than five medications (Qato et al., 2016). Almost 70% of the older adults using prescription medications are concurrently taking nonprescription drugs, dietary supplements, or both. These findings are consistent with results across studies.

Increased medication use has been described as the "...single most important healthcare technology in preventing injury, disability, and death in the geriatric population" (Avorn, 2017). Still, the complexities of medication management in this population make drugs "a double-edged sword" (Simonson & Feinberg, 2005). The risks of using multiple medications in older adults are augmented with decreased physiological functionality. Cognitive challenges make older adults the most vulnerable population to "medication misadventures," which include adverse drug events and medication errors (Gupta & Agarwal, 2013; Hanlon et al., 2014; Roth & Ivey, 2005). Elderly patients aged 70 to 90 years take almost three times the number of medications that younger adults take, and subsequently also experience three times as many adverse events related to drugs (D. H. Smith et al., 2009). The dangers of medication nonadherence (i.e., the degree to which patients deviate from medication prescriptions and instructions) in this population include not only therapeutic failure, but also a significantly increased risk of health-related adverse events compared to other populations (Marcum, 2017). In a sample of 600 older adults with inpatient admissions, 68.9% of those admissions were classified as potentially related to inappropriate use of medications (Hamilton, 2011).

These increased risks warrant further exploration and attention to potential predictors of medication adherence. Medication adherence is a complex and multi-faceted issue which is influenced by patient demographics, health-care system related factors, and medication or therapy-related factors. Some predictors of medication nonadherence are not modifiable via intervention (Mohiuddin, 2019). However, a 2020 overview of systematic reviews related to medication nonadherence listed patient education as one of most effective past intervention types (Marcum, 2020). Two of the primary ways in which patient education is predicted to influence nonadherence is through changes in what older adults know about their medications (medication knowledge), and what they believe about taking these medications (medication beliefs) (Sweileh, 2014).

2.2 Medication Knowledge

Overall, elderly individuals have limited knowledge of their medications, but results vary significantly, based on what domains are included in assessments of medication knowledge (see Table 2.1) (Barat et al., 2001; Bazargan & Barbre, 1992; Blenkiron, 1996; Bosch-Lenders et al., 2016; Burns et al., 1990; Chan et al., 2013; Chung & Bartfield, 2002; Cline et al., 1999; Cruz et al., 2011; Hayes, 1999; Hoisnard et al., 2018; Hope et al., 2004; Kristensson et al., 2010; Mira et

al., 2014; Modig et al., 2009; Mosher et al., 2012; Najjar et al., 2015; O'Connell & Johnson, 1992; Pinto et al., 2016; Sela-Katz et al., 2010; Spiers et al., 2004). In a population of older adults that were prescribed an average of 3.75 ± 1.93 medications, less than 4% could recall any side effects or precautions for any of their medications. In addition, 25% of them could not correctly name the purpose, or the frequency in which they were supposed to take, their medications. However, 99% knew medication route, and 81% knew medication dosage (e.g. one tablet, two capsules, etc.) (Chan et al., 2013).

Similar results have been seen in other studies. In a study of 348 Danish adults over the age of 75 years old, over half knew the purpose of their treatment, but less than 6% could name a risk, side effect, or drug interaction (Barat et al., 2001). In another smaller study based in the United States, less than 50% (N=21) of older adults believed they could describe the purpose, side effects, risks, and basic instructions of their medications (Takane et al., 2013). Over the last two decades, the most frequently identified knowledge deficit pertains to patients' knowledge of the negative effects of medications, such as side effects and risks (Barat et al., 2001; Chan et al., 2013; Mira et al., 2014; Modig et al., 2009; O'Connell & Johnson, 1992).

Researchers also have explored the impact of medication knowledge deficits on medication safety. In a sample of 382 older adults taking multiple medications, 75% reported at least one medication error within the last year. These medication errors included: taking the wrong dosage of medications and taking the wrong medication. One of the major causes of these errors was a lack of understanding of physician instructions (Mira et al., 2013). Positive perceptions of healthcare provider communication are related to decreases in medication errors, such as skipping doses of medication, taking extra medication that was not prescribed, and taking medications at the wrong times (Balkrishnan, 1998).

In addition, increased medication knowledge has been linked to greater medication adherence (Barat et al., 2001; Sweileh, 2014). However, little is known about how knowledge affects adherence, such as through increased understanding of the benefit of the medication, or

Table 2.1. Summary of Medication Knowledge Studies in Older Adults

Study Information	Operational Definition	Included Variables	Major Findings
Barat (2001) N= 348 75 years Cross-Sectional Community-dwelling older adults in Denmark	"…the drug side-effects, the purpose of treatment, toxicity, consequence of omission, and possible interaction with other drugs."	Medication adherence	Increased knowledge of drugs was associated with an increased likelihood of adherence. Specifically, knowledge of the purpose of the medication and knowledge of the implications of missed doses were significantly associated with an increased likelihood of adherence (OR ranging from 1.8-9.5).
Bazargan & Barbre (1992) N=621 ≥ 62 years Cross-sectional Black community-dwelling elderly taking at least one prescription drug in the United States	"…patient knowledge of the therapeutic function of their prescribed drugs."	Number of prescription drugs used, health status, mental condition, self-reported memory, perceived availability and accessibility of physician and pharmaceutical services	Of the 31.9% of patients with at least one error in the identification of a medication, 15.5% did not identify the medicine, and 24% misidentified. Regression revealed a greater risk of misidentification or nonidentification of medication purpose in subjects of older age, male gender, larger numbers of total prescription drugs, lower perceived accessibility to physician services, and cognitive deficit.
Blenkiron (1996) N=80 ≥ 75 years old Cross-sectional Community-dwelling older adults in the United Kingdom	"…patient responses in three areas: name correct, purpose known, and timing/dose correct."	Degree of compliance, problems with medicines, medication class	Subjects reported wanting to know more about medication in less than 1/3 of the medicines where patients reported no knowledge. In the 25% of drugs where the patient reported an incorrect dosage regimen, 39.2% were related to medications that were prescribed "as needed."
Bosch-Lenders (2016) N=754 ≥ 60 years old Cross-sectional Patients prescribed ≥ five drugs	"…patients' understanding of the indications for their prescribed drugs."	Medication use, sex, age, living situation, educational level	Medication knowledge is negatively associated with a greater number of prescribed medications, older age, and male gender. Independent subjects living with a partner had significantly greater knowledge than those living alone or those living in a retirement home.

Table 2.1 continued

Study Information	Operational Definition	Included Variables	Major Findings
Burns (1990) N=207 ≥ 65 years old Cross-sectional Elderly patients in a geriatric outpatient clinic	"…name or description of drugs taken" and "the medical reason for taking each drug."	Age, cognitive function	After controlling for cognitive function, older age was negatively associated with agreement between physicians and patients about the number of drugs. Cognitive function was positively associated with medication knowledge. Patients taking drugs with potentially dangerous adverse effects were not aware of the possible side-effects of those medications. None of the patients taking hypoglycemics, NSAIDs, or warfarin could name a single potential adverse drug reaction of those medications. Doctors and patients only agreed about 16.7% of the 42 adverse drug reactions in the sample. Thirty-eight percent of subjects wanted to know more information about the purpose of their medication, and 47% wanted to know more information about the side-effects of their medication.
Chan (2013) N= 412 ≥ 60 years old Cross-Sectional Older adults in Hong Kong picking up prescriptions from a pharmacy	"…an awareness of the drug name, purpose, administration schedule, adverse effects or side-effects, or special administration instructions."	Number of medications prescribed, age, education level	Over half of patients felt administration instructions were clear from HCP, but only 11.4% felt that explanations of side effects were clear. Increased numbers of medications decreased the likelihood of recalling side effects. Higher education levels are associated with an increased chance of remembering side effects.
Chung & Bartfield (2002) N=77 ≥ 65 years old Cross-sectional Elderly patients on chronic medications presenting to ED of an urban teaching hospital	"…the name, dose, dose frequency, and indication of their medications."	Age, number of medications	An average of nearly six medications was prescribed per patient. Increased number of prescribed medicines are associated with a decreased likelihood of correctly identifying the name of drugs. Less than 1/3 of patients indicated a desire for more information about their medication. Age was not associated with knowledge.

Table 2.1 continued

Study Information	Operational Definition	Included Variables	Major Findings
Cline (1999) N=22 70-97 years old Cross-sectional Clinically stable heart failure discharged after hospitalization due to heart failure	"The extent…patients could recall the information they had received in conjunction with the prescription of medication."	Medication adherence, number of medications	All patients in the study were provided standardized verbal and written information about medication. Over 90% of patients recalled receipt of verbal medication information, 23% recalled receipt of written medication information, and 9% did not recall receipt of any medication information.
Cruz (2011) N=17 ≥ 60 years old Patients with BAD treated at a Mental Health Center	"Knowledge regarding the following aspects of medication- name, dose, and frequency of use."	Medication adherence, difficulties with pharmacological therapy	A majority of patients had 0% knowledge of the dose and frequency of their medication.
Hayes (1999) N=60 ≥ 60 years old Cross-sectional Rural ED patients discharged home with new prescribed or recommended medication	Not defined- utilized Knowledge of Medication Subtest (KMS)	Age, education level, literacy level, medication complexity after ED treatment	The range of scores was 36 to 74, with a mean of 49.78 (SD = 7.86). The only statistically significant predictor in multiple regression analyses of medication knowledge was medication complexity.
Hoisnard (2018) N= 2,690 ≥ 68 years old Cross-Sectional Community-dwelling older adults in Switzerland	"…knowledge of the exact purpose or identification of the anatomical system or organ targeted by the drug."	Age, comorbidities, polypharmacy, self-perceived health, cognitive complaints, receiving help with drug management, satisfaction with the financial situation, having a general practitioner	Lower knowledge scores are associated with chronic medications when compared to acute medications ($p < 0.001$). Differences in knowledge based on drug class with platelet aggregation inhibitors and anticoagulants were related to the lower knowledge scores.

Table 2.1 continued

Study Information	Operational Definition	Included Variables	Major Findings
Hope (2004) N=61 ≥ 50 years old Cross-sectional patients with congestive heart failure recruited from the emergency department	"…dosage, frequency, and indication each of their CHF medications"	Medication adherence, medication skills, medication knowledge, emergency department visits	Increased number of ED visits related to CHF associated with decreased knowledge of CHF medication dose (p=0.002).
Kristensson (2010) N=63 ≥ 65 years old Longitudinal need help with at least two activities that are part of their daily living, have had at least two hospital admissions, or four outpatient physician contacts, during the last 12 months	"…defined as being able to state the indications without reading them from a list"	Healthcare utilization, age, gender, marital status, living arrangements, health complaints, self-reported diseases	Patients with poor knowledge of indication had increased numbers of acute hospital admissions, total hospital admissions, and greater length of stay. Increased outpatient physician visits associated with increased knowledge of indication. Patients who received help with their medication dispensing had decreased knowledge of medication indication.
Mira (2014) N=265 ≥ 65 years old Cross-sectional taking at least five drugs for multiple comorbidities	"…whether they knew the relationship between the drug indication and the disease for which it had been prescribed, the corresponding dosage, precautions for the safe use of the drug and how to store it properly"	Medication-related information received from physician, comorbidities, number of drugs, living status, receiving help with medications, health status, number of physicians consulted	Higher medication knowledge scores related to patients who reported receiving information from physicians and lower numbers of medication errors. Lower medication knowledge scores related to frequent changes in medication regimen.

Table 2.1 continued

Study Information	Operational Definition	Included Variables	Major Findings
Modig (2009) N=34 ≥ 65 years old Cross-sectional Swedish primary care with multiple illnesses	"…graded as good knowledge if the patient could tell the purpose of the medication."	Medication beliefs	No association between medication knowledge and medication belief (potentially underpowered for this correlation).
Mosher (2012) N=310 ≥ 65 years old Longitudinal taking 5 or more medications and who were enrolled in a Veterans Administration primary care clinic.	"…could recall medication names from memory, were recorded as having correct understanding; indication was likewise judged."	Health literacy	Medication knowledge across health literacy groups with lower knowledge in low and marginal health literacy groups as compared to adequate health literacy (P<0.001).
Najjar (2015) N=1192 ≥ 60 years old Cross-sectional Palestinian living with chronic diseases	"…recognition of the drug, knowledge of the drug's indication(s), mentioning one side effect of the drug, knowledge of proper preservation methods, knowledge of the daily dose, knowledge of how to act when a dose is missed, and knowledge of prescription status."	Personal and socio-demographic data (gender, age, place of residence, educational level, physical activity, marital status, living status, profession, monthly household income, smoking status, type of insurance), health condition, medication adherence, number of medications	Higher knowledge scores associated with male gender, education level, independent living, physical activity level, work status, income, and smoking status. Lower knowledge scores associated with age, and number of medications. Positive association between medication knowledge and medication adherence.

Table 2.1 continued

Study Information	Operational Definition	Included Variables	Major Findings
O' Connell & Johnson(1992) N=765 ≥ 60 years old Cross-sectional taking at least one prescription medication recruited from medicine and geriatric clinics	"…the name, dosage, administration frequency, and indication for each of their medications"	Use of compliance aid, receipt of verbal and written medication information, age, total number of medications	16% could not recall receiving verbal information and 61% could not recall receiving written information. Less than 1/3 reported receiving any information about side effects.
Pinto (2016) N=227 ≥ 60 years old Cross-sectional a user of the PHC in Belo Horizonte, receiving medication in the pharmacies of the PHUs	"…concordance analysis had been done based on the responses from the interviewees and the information on the medical prescriptions such as: name of medication, dosage, frequency, indication, precautions and side effects"	Sociodemographic characteristics (gender, age, level of education, living status, income, marital status and race), clinical characteristics (comorbidities, depression, health status, cognition), functional characteristics (activities of daily living), characteristics related to the use of the medication (number of medications, complexity, adherence, medication independence, guidance received from the healthcare professionals)	Over half of sample classified as having insufficient knowledge of their medications. Those with lower education levels and dependency on a medication were at greater risk for insufficient medication knowledge.

Table 2.1 continued

Study Information	Operational Definition	Included Variables	Major Findings
Sela-Katz (2010) N=425 ≥ 65 years old Cross-sectional community-based geriatric assessment unit	"responsible for taking the medications and when he or she knew what each medication was for and how many times a day it should be taken"	Cognitive Function, age, gender, number of medications	Over half of the sample was classified as having lack of basic knowledge of their medications. Increased age and decreased cognitive functioning, and dementia diagnosis were statistically significantly related to lack of medication knowledge.
Spiers (2004) N=375 ≥ 65 years old Cross-sectional Community-dwelling older adults volunteered to participate in a medication review program	"asked the following questions about each drug: How many times a day are you supposed to take this medicine? When are you supposed to take this medicine? How much or how many should you take each time? What should you do if you miss a dose?"	Age, sex, ethnicity, living situation, education, and medical history, attitudes toward medications and physician– patient communication	62% scored as perfect medication knowledge, 7.5% misunderstanding type one aspect of knowledge across multiple medications, 7.0% misunderstanding multiple aspects of a single medication, and 23.5% other misunderstandings.

changes in misperceptions about the adverse effects. Even less is known about how medication knowledge affects clinical outcomes such as morbidity, mortality, and quality of life. More work is needed to assess how gaps in medication knowledge impact medication adherence and resulting clinical outcomes. However, before studies can be designed to assess these outcomes, more attention needs to be given to how to conceptualize and measure medication knowledge.

2.2.1 Measurement

Mixed results of past studies on medication knowledge in older adults are due, in part, to lack of consensus on the operational definition of medication knowledge (see Table 2.2) (Barat et al., 2001; Bazargan & Barbre, 1992; Blenkiron, 1996; Bosch-Lenders et al., 2016; Burns et al., 1990; Chan et al., 2013; Chung & Bartfield, 2002; Cline et al., 1999; Cruz et al., 2011; Hayes, 1999; Hoisnard et al., 2018; Hope et al., 2004; Kristensson et al., 2010; Mira et al., 2014; Modig et al., 2009; Mosher et al., 2012; Najjar et al., 2015; O'Connell & Johnson, 1992; Pinto et al., 2016; Sela-Katz et al., 2010; Spiers et al., 2004). Definitions of medication knowledge range from "being able to state the indications (of prescription medications)..." to "whether (patients) knew the relationship between the drug indication and the disease for which it had been prescribed, the corresponding dosage, precautions for the safe use of the drug and how to store it properly."

Lack of a consistent operational definition of medication knowledge has led to variations in the domains (e.g. name, indication, usage instructions, interactions, etc.) of medication knowledge included in measurement instruments. Among the studies specifically focused on older adults presented in Table 2.2, the number of domains included in the measurement of medication knowledge ranged from one to seven, and the average number of domains included in measurement was 3.15.

Table 2.3 presents the results for the 21 outcomes studies in older adults across eight possible medication knowledge domains (Barat et al., 2001; Bazargan & Barbre, 1992; Blenkiron, 1996; Bosch-Lenders et al., 2016; Burns et al., 1990; Chan et al., 2013; Chung & Bartfield, 2002; Cline et al., 1999; Cruz et al., 2011; Hayes, 1999; Hoisnard et al., 2018; Hope et al., 2004; Kristensson et al., 2010; Mira et al., 2014; Modig et al., 2009; Mosher et al., 2012; Najjar et al., 2015; O'Connell & Johnson, 1992; Pinto et al., 2016; Sela-Katz et al., 2010; Spiers et al., 2004).

Table 2.2. Medication Knowledge Measurement in Older Adults

Reference	Measurement	Knowledge Domains	Knowledge Aids*	Scoring
Barat (2001)	In-home interviews, agreement with physician records	Indication, usage instructions, side effects, contraindications, interactions	No	Each item scored as correct (1 point), no knowledge (0 points), or wrong (0 points). Knowledge score represents total number of points scored divided by total number of drugs used. Ratios > 0.75 were considered "good knowledge of medication."
Bazargan & Barbre (1992)	In-home semi-structured interview	Indication	Yes	Single item scored as correct, incorrect, or no identification if the subject answered "no." For regression, sample divided into two groups: subjects who knew the purpose of all of the medications and those who could not identify or misidentified at least one of their medications.
Blenkinron (1996)	In-home or in-clinic interviews	Indication, name, usage instructions	Yes	Each drug scored separately. Each knowledge domain = scored as yes, no, or partial.
Bosch-Lenders (2016)	Home interviews, postal Questionnaires	Indication	Yes	Single item scored as 'correct', 'incorrect' or 'unknown'. Answers that could identify the correct system or organ associated with the indication were scored as correct. Percentages represent patient-level measure of those who accurately identified indication for all medications. Cut-offs for 'correct recall' were 100% and 75%.
Hayes (1999)	Telephone Interview, the knowledge of medication subtest	Not reported	Not reported	Each item is evaluated utilizing a 3 or 4 level scale scored by a single investigator. Correct answers are scored as a "1," and higher scores reflect less knowledge.
Hoisnard (2018)	Mailed Survey	Indication	Not reported	Single item categorized according to a 5 level scale (4 = knowledge of the exact purpose, 3 = correct identification of the anatomical system or organ targeted by the drug, 2 = incorrect purpose or "sketchy" answer, 1 = the participants indicated that they did not know, 0 = no response). Scored by single medication doctor with "borderline responses" discussed with multidisciplinary group.

Table 2.2 continued

Reference	Measurement	Knowledge Domains	Knowledge Aids	Scoring
Hope (2004)	Interview	Indication, usage instructions, timing of dose	Not reported	Each item scored on 2 point scale (0= no correct answers, 1= partially correct responses, 2= correctly answered all questions). Scores analyzed as mean total score and percentage of patients who received 2 points.
Krisstensson (2010)	Interview	Indication, side effects	Yes	Knowledge of indication graded on 3-point scale (Knowledge, knowledge from written information, and no knowledge). Knowledge of side effects graded as a dichotomous variable (Yes, No). Number of drugs for which the patient was scored as "knowledge" for the medication indication was divided by total number of prescribed medications to get total percentage of medication knowledge. "Less knowledge" was considered as those who scored 50% or less, and "More Knowledge" was considered as those who scored greater than 50%.
Mira (2014)	Interview, the Garcıa-Delgado six-item questionnaire	Indication, name, usage instructions, timing of dose, contraindications, storage	Not reported	Each correct item scored as one point, with correctness being scored by a single pharmacist.
Modig (2009)	Interview, self-developed questionnaire	Indication, side effects	Yes	Knowledge of indication scored on 3 point scale ("good knowledge," knowledge with written information," and no knowledge." Patients with "knowledge with written information" and "good knowledge" combined for analysis. Knowledge about side effects graded dichotomously (Yes/No).
Mosher (2012)	Face-to-face interview, self-developed structured protocol	Indication, name	No	Scored as individual items
Najjar (2015)	Questionnaire-assisted interview	Indication, name, timing of dose, side effects, storage	Not reported	Positive answers scored as 1 and negative answers scored as 0. Score percentage for each item calculated, and sufficient knowledge scored as positive answers for 5 of 7 knowledge items.

Table 2.2 continued

Reference	Measurement	Knowledge Domains	Knowledge Aids	Scoring
O'Connell & Johnson (1992)	Interview	Indication, usage instructions, timing of dose	Not reported	Each item scored as correct or incorrect. Patients divided into groups based on percentage of their medication with correct knowledge score (0-25%, 26-50%, 51-75%, 76-110%). Mean percentage of medication with correct knowledge also calculated.
Pinto (2016)	Interview	Indication, name, usage instructions, timing of dose, side effects, contraindications	Yes	A scoring evaluation tool used by 2 scorers who score items based on agreement with medication prescription and provided medication information. Responses scored dichotomously as correct or wrong. Correct name, dosage, and frequency were given 2 points, and correct side effects and precautions were given 1 point. Incorrect answers and answers in which that subject did not know the answer were scored as zero. Knowledge classified as insufficient for subjects scoring less than 70% of the points on the evaluation.
Sela-Katz (2010)	Interview	Not reported	Yes	Patients scored dichotomously as "having basic knowledge" or "lacking basic knowledge" of medications.
Spiers (2004)	Interview, personal medication regimen understanding assessment (PMRUA)	Indication, name, usage instructions, timing of dose	Yes	Each item scored as correct (1) or incorrect (0) based on comparison with the prescription label. All subjects scoring less than 100% were classified into different types of "misunderstanders:" misunderstanding of a single or limited aspect of knowledge across multiple medications, misunderstanding across multiple aspects of at least one medication, and other misunderstanding.

*Knowledge aids are resources participants were able to reference during the assessment of medication knowledge such as medication prescription bottles or medication information sheets.

Table 2.3. Percentage of Older Adults with Correct Answers to Specific Medication Knowledge Domains

Study	Indication	Effectiveness	Name	Usage Instructions	Duration of Treatment	Timing of Dose	Side Effects	Contraindications Precautions Warnings	Interactions	Storage
Barat (2001)[1]	60.0	--	--	52.0	--	--	4.0	5.0	0.0	--
Bazargan & Barbre (1992)[2]	68.1	--	--	--	--	--	--	--	--	--
Blenkiron (1996)[3]	72.0	--	64.0	75.0[4]	--	--	--	--	--	--
Bosch-Lenders (2016)[2]	15.0	--	--	--	--	--	--	--	--	--
Burns (1990)[2]	51.0	--	35.0	--	--	--	--	--	--	--
Chan (2013)[2]	76.2	--	--	80.7[4] 99.0[5]	--	74.1[6]	3.9	--	--	--
Chung (2002)[3]	83.3	--	78.4	65.5[7]	--	91.4[6]	--	--	--	--
Cline (1999)[8]	--	--	55.0	50.0[7]	--	36.0[9]	--	--	--	--
Cruz (2011)[1]	--	--	29.4	17.6[7]	--	17.6[6]	--	--	--	--
Hayes (1999)[10]	--	--	--	--	--	--	--	--	--	--
Hoisnard (2018)[3,11]	80.6	--	--	--	--	--	--	--	--	--
Hope (2004)1[2]	19.7	--	--	65.6[7]	--	49.2[6]	--	--	--	--
Kristensson (2010)[13]	48.0	--	--	--	--	--	21.0	--	--	--
Mira (2014)[8]	67.8	--	75.8	63.9[7] 67.8[5]	--	59.0[6]	--	3.9[14]	--	27.1
Modig (2009)[1]	71.0	--	--	--	--	--	16.0[15]	--	--	--
Mosher (2012)[3]	56.4	--	78.5	--	--	--	--	--	--	--

Table 2.3. Continued

Study	Indication	Effectiveness	Name	Usage Instructions	Duration of Treatment	Timing of Dose	Side Effects	Contraindications Precautions Warnings	Interactions	Storage
Najjar (2015)[8]	84.4	--	80.6	--	--	90.7[6]	16.9[16]	--	--	92.2
O'Connell & Johnson (1992)[1]	66.0	--	--	29.0[7]	--	64.0[6]	--	--	--	--
Pinto (2016)[3]	84.4	--	75.8	86.2[7]	--	82.7[6]	6.9	24.0[14]	--	--
Sela-Katz (2010)[10]	--	--	--	--	--	--	--	--	--	--
Spiers (2004)[2]	87.0	--	68.0	95.0[7]	--	94.0[6] 94.0[17]	--	--	--	--

[1] Percentage of subjects with good /correct knowledge of at least 75% of their medications.
[2] Percentage of subjects with correct response across all prescribed medications.
[3] Percentage of medications with correct answer
[4] Dosage regimen
[5] Route
[6] Frequency
[7] Dose
[8] Percentage of subjects with correct response for a single prescribed medication
[9] Time of day and dose in relation to meals
[10] Only total knowledge reported, domains included in the score unknown and results of sub-domains not reported
[11] Correct answer score of 3 and 4 on 4 point scale
[12] Percentage of subjects with correct response across all CHF medications
[13] Percentage of subjects with knowledge of greater than 50% of their medications
[14] Precautions
[15] Percentage of subjects who had correct knowledge for at least one of their medications
[16] Percentage of subjects who could name one side effect

The most frequently measured domain was indication, followed by usage instructions (dose, route) and timing of dose (frequency, time of day, or time in relation to meals). All other domains were measured in less than one third of the studies. Domains measured in other populations, but not measured in any study with older adults, were: effectiveness of the medication and duration of treatment. These differences in measurement may impact medication knowledge scores, and should be considered when reviewing the results of any study focused on medication knowledge. For example, in one study, an instrument measuring medication usage instructions as the only domain of medication knowledge resulted in higher medication knowledge scores than similar studies measuring a greater number of knowledge domains (Spiers et al., 2004).

While a few studies chose to use or adapt knowledge instruments that had been utilized in previous studies, no single instrument saw repeated use across more than two studies. Instead, most researchers elected to utilize self-developed instruments (Barat et al., 2001; Modig et al., 2009; Spiers et al., 2004). In most of these studies, the reasoning for including specific aspects of medication knowledge in the measurement tool was not explicitly stated, and no methodology for questionnaire development was provided. Self-Katz et al. presented the following argument for their self-developed medication knowledge instrument, "Although different tools for assessing medication management have been used, we applied the above test because, in our view, basic knowledge of the medication regimen, as defined above, embodies a minimal requirement for correct use of medications" (Sela-Katz et al., 2010). This reasoning summarizes one of the primary factors that continues to limit the cohesiveness of medication knowledge measurement across populations and settings; there is no clinical consensus as to what represents adequate knowledge of medications.

Variation in measurement of medication knowledge is not limited to studies focusing on older adults. Lack of consensus among healthcare providers about what types of medication knowledge are necessary for patients to understand is specifically cited as one of the reasons for differences in the approach to measurement of medication knowledge across all populations (Dickinson & Raynor, 2003). In 2008, a group of researchers in Spain created a questionnaire designed to measure patient's medication knowledge (PMK) (Delgado et al., 2009). The questionnaire consists of 11 open-ended questions that were developed through a review of literature, expert panel, and pilot studies. PMK was defined as "the information acquired by the patient on a medication, necessary for proper use of it that included the therapeutic objective

(indication and effectiveness), the process of use (dosage, regimen, route of administration and duration of treatment), security (adverse effects, precautions, contraindications, and interactions) and conservation (storage)." The questionnaire was validated and tested in Spain, and measured four dimensions of medication knowledge:

- Medication use process (dosage, frequency, duration of treatment and form of administration)
- Therapeutic objective (indication and expected therapeutic outcome)
- Medication safety issues (precautions and warnings, side effects, contraindications, interactions)
- Storage of medication (storage recommendation).

This instrument represents the most comprehensive measurement of medication knowledge to date. However, this instrument has not been adapted for use in the United States or utilized in any known studies focused on older adults. The domains measured by the PMK are included in Table 2.3 and serve as a comparison against medication knowledge studies in the older adult population. It is important to note, however, that there is no widely accepted "gold-standard" for the measurement of medication knowledge. The PMK was selected for comparison due to the comprehensive nature of the tool, but the domains included in the PMK were developed by researchers and not by clinical experts. The literature does not point to a consensus about what domains should be included in the measurement of medication knowledge.

Recently, major healthcare organizations, including the Center for Medicare and Medicaid Services, the Institute for Safe Medication Practices, the National Consumers' League, and the National Council on Patient Information and Education, collaborated to create a list of medication-related questions that they believe represents the most important aspects of medication knowledge (Bullman 2015). The ten questions are listed in Table 2.4. These questions are very similar to another list created by the American Medical Association, the American Association of Colleges of Nursing, the American Association of Colleges of Pharmacy, and Agency for Healthcare Research and Quality. These six questions are also included in Table 2.4.

Consensus across healthcare professionals, government agencies, and patient advocates is promising for the future use of these questions to evaluate medication knowledge; however, no known study to date has made use of this list as a measure of medication knowledge, and these questions have not been utilized in the older adult population.

Table 2.4. Domains Covered by Clinical Experts' Lists of Necessary Medication Knowledge Questions

Knowledge Domains[1]	Center for Medicare and Medicaid Services, the Institute for Safe Medication Practices, the National Consumers' League, and the National Council on Patient Information and Education	Knowledge Domains[2]	American Medical Association, the American Association of Colleges of Nursing, the American Association of Colleges of Pharmacy, and Agency for Healthcare Research and Quality
Name Indication	1. What's the name of the medicine, and what is it for?	Name Indication	1. What's my medicine called and what does it do?
SIG Duration	2. How and when do I take it, and for how long?	SIG Duration	2. How and when should I take it? And for how long?
Side effects	3. What side effects should I expect, and what should I do about them?	Instructions	3. What if I miss a dose?
Interactions (food)	4. Should I take this medicine on an empty stomach or with food?	Side effects	4. Are there any side effects?
Contraindications & Warnings	5. Should I avoid any activities, foods, drinks, alcohol, or other medicines while taking this prescription?	Interactions	5. Is it safe to take with other medicine or vitamins?
Timing	6. If it's a once-a-day dose, is it best to take it in the morning or the evening?	Duration/ Effectiveness	6. Can I stop taking it if I feel better?
Interactions (medications)	7. Will this medicine work safely with other medicines I'm taking, including over-the-counter medicines?		
Effectiveness	8. When should I expect the medicine to begin to work, and how will I know if it's working?		
Storage	9. How should I store this medicine?		
Medication Information Sources	10. Is there any additional written information I should read about the medicine?		

[1]Adapted from National Council on Patient Information and Education (NCPIE) national education campaign, Talk Before You Take.

[2]Adapted from National Institute on Aging national education campaign, Safe Use of Medicines for Older Adults.

There are several other sources of variability in the methodology and measurement of medication knowledge. Table 2.2 presents a list of results, along with details about the methods of each medication knowledge study in the older adult population. While all studies utilized some form of interview to access patient knowledge, there is lack of clarity in many studies about who conducted these interviews and how the interviewers were specifically trained. In addition, there are differences in how patient answers were scored. Many studies failed to provide information on who was selected to score the answers, and how it was determined if an answer was correct. Even among studies that provided these details, a variety of sources were used to determine the accuracy of the answer. There was also lack of consensus about how the answer "I don't know" should be scored.

There were differences across studies in interview procedures. Some studies allowed patients to reference their medication bottles, list, or other knowledge aids, while other studies did not allow this or did not specify whether or not aids were utilized. Other studies allowed for the caregivers of patients to provide answers during the interview or prompt or assist the patient in providing answers. Finally, some studies focused on one medication, while others inquired about all current patient medications. Because of these differences, the unit of analysis for some studies is the patient, while other studies utilized a medication as the unit of analysis.

2.2.2 Gap

Although some domains of medication knowledge have been studied, no comprehensive measure of medication knowledge has been used in research studies with older adults. There is a lack of connection between researcher-developed questionnaires and consensus recommendations from clinicians for patients' medication knowledge. Finally, there has been no consensus to date about how "good" medication knowledge should be defined. Past studies have used a variety of cut-off points to represent adequate medication knowledge, but no past study has provided rationale for the selection of these cut-off points.

Some measurement domains, including knowledge of the effectiveness of a medication and duration of treatment, have never been studied in older adults. No known previous studies measure knowledge of medication interactions (i.e. two or more drugs that affect each other and may cause loss of clinical effect or adverse events) among older adults in a real-world setting. The ability of older adults to remember drug interactions has been compared to younger adults in an experimental

setting (Hargis & Castel, 2018). There was no difference in memory of medications interactions due to age, however older adults were more likely to remember interactions that they were told were severe (Hargis & Castel, 2018).

Lack of clarity also exists about qualitative methodologies utilized to illicit and score patient responses to medication knowledge instruments. Most studies failed to report the specific questions utilized to measure medication domains, and it is unknown how the wording of these questions may impact the results of the knowledge assessment.

2.3 Medication Beliefs

Along with medication knowledge, another avenue by which patient education may influence medication adherence is through influencing patients' beliefs about the necessity of their medications and their concerns about medications (Sweileh, 2014). The inclusion of beliefs alongside knowledge as a potential intermediary variable of adherence is warranted when considering past work that documents the failure of knowledge alone to change human behavior (Kelly, 2017).

Various social-behavioral theories such as the Theory of Planned Behavior (Ajzen, 1991) and the Health Belief Model (Strecher and Rosenstock 1997) propose that individuals make decisions based on a variety of cognitive factors including attitudes, beliefs, and perceptions. In the last four decades, research has broadened its focus to include not only beliefs about illness but also beliefs about treatment. Specifically, cognitive representations of medications have been explored, and common themes for these beliefs have been identified, including beliefs about the negative effects of medications and beliefs about the necessity of medications (Horne et al., 1999). The Beliefs About Medicines questionnaire (BMQ) was developed based on the idea that individuals have both general beliefs about the use of medications, specific beliefs about the necessity of medications, and potential concerns about the medications prescribed to them (Horne et al., 1999). This instrument is based on the idea that patients make adherence decisions using a risk-benefit ratio related to these medication beliefs (Horne et al., 1999).

Medication beliefs have been studied in many different settings and populations and have been found to be a more reliable predictor of adherence than any other clinical or sociodemographic factor (Al-Noumani, 2019, Horne et al., 1999). In general, patients that report

higher levels of medication necessity also report greater adherence. Alternatively, patients that report higher levels of concern about medications report lower adherence (Clifford et al., 2008).

A variety of studies over the last decade have specifically addressed medication beliefs of older adults (see Table 2.5). Sample sizes in studies measuring medication beliefs in the older adult population range from 33-5,034 participants (Bae et al., 2016; Cicolini et al., 2016; Clyne et al., 2017; Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Fawzi et al., 2012; Federman et al., 2013a; Hong, 2019; McLoughlin et al., 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Schüz et al., 2011a; Sirey et al., 2013; Straßner et al., 2020; E. Unni et al., 2015; E. J. Unni & Farris, 2011). Studies have been conducted in both international-based settings (Bae et al., 2016; Cicolini et al., 2016; Clyne et al., 2017; Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Fawzi et al., 2012; McLoughlin et al., 2019; Schüz et al., 2011a; Straßner et al., 2020) and Unites States based populations (Federman et al., 2013a; Hong, 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Sirey et al., 2013; E. Unni et al., 2015; E. J. Unni & Farris, 2011). A majority of studies measure medication beliefs using the specific necessity and concern beliefs scales (Bae et al., 2016; Cicolini et al., 2016; Clyne et al., 2017; Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Fawzi et al., 2012; Federman et al., 2013a; McLoughlin et al., 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Schüz et al., 2011a; Sirey et al., 2013; E. Unni et al., 2015; E. J. Unni & Farris, 2011), with scores ranging from 12.9-19.7 for necessity beliefs and 11.7-15.1 for concern beliefs. Less work utilized the general overuse and harm beliefs scales, with scores ranging from 9.2-13.0 for general overuse beliefs and 8.9-12.7 for general harm beliefs (Clyne et al., 2017; Fawzi et al., 2012; Hong, 2019; Rajpura & Nayak, 2014; Schüz et al., 2011a; Straßner et al., 2020).

Many studies in older adult populations measure medication adherence in conjunction with medication beliefs (Bae et al., 2016; Cicolini et al., 2016; Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Fawzi et al., 2012; McLoughlin et al., 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Schüz et al., 2011a; Sirey et al., 2013; E. Unni et al., 2015; E. J. Unni & Farris, 2011). Necessity scores were statistically significantly and positively related to adherence in a majority of cross-sectional studies (Bae et al., 2016; Cicolini et al., 2016; Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Fawzi et al., 2012; McLoughlin et al., 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Schüz et al., 2011a; E. Unni et al., 2015; E. J. Unni & Farris, 2011), with only one study reporting no differences in necessity beliefs between adherent and nonadherent groups (Sirey et al., 2013).

Table 2.5. Summary of Medication Beliefs Studies in Older Adults

Study Information	BMQ Results	Variables	Co-variates	Major Findings
Bae (2016) N=401 74.5 (SD not reported) Cross-sectional Patients in rural Gyeongsang prescribed hypertensive drugs	Necessity scale - 16.5 (SD not reported) Concern scale - 12.4 (SD not reported)	Independent variable(s) - Medication beliefs - Self-efficacy Dependent variable(s) - Medication adherence	Sociodemographics, illness-related factors, polypharmacy, regimen complexity	There was no difference in concerns beliefs between nonadherent and adherent groups, but the adherent group had statistically significantly higher necessity scores than the nonadherent group (P=0.001). Concern beliefs were not a statistically significant predictor of adherence (direct β=0.132 0.132, P=0.151; indirect β=-0.006, P=0.909). Necessity beliefs were a statistically significant predictor of adherence (direct β=-0.275, P=0.002; indirect β=-0.113, P=0.036).
Cicolini (2016) N=567 75.9 (6.9) Cross-sectional Community-dwelling older adults in Italy prescribed at least four medications	Necessity scale - 4.1 (0.7)* Concern scale - 3.2 (1.0)* *these scores are divided by number of items in the scale to get the mean	Independent variable(s) - Medication beliefs Dependent variable(s) - Medication adherence	Age, gender, marital status, level of education, diseases and disabilities, total number of medications per day	Over 70% of subjects were classified as ambivalent (high necessity score and high concern score). Only 1.2% were classified as skeptical (low necessity score and high concern score)., and only 1.1% indifferent (low necessity score and low concern score). High necessity and concern scores significantly increased the odds of subjects reporting high adherence (OR: 1.61, and 2.02, respectively; both p<.001), however subjects classified as accepting were more likely to report low adherence than those classified as ambivalent (OR: 0.24; p<.001).

Table 2.5 continued

Study Information	BMQ Results	Variables	Co-variates	Major Findings
Clyne (2017) N=196 76.7 (4.9) Cross-sectional Primary care patients in Ireland	Necessity scale - 19.7 (3.3) Concern scale - 12.8 (3.9) Overuse scale - 10.9 (2.9) Harm scale - 9.8 (2.9)	Independent variable(s) - Number of medications Dependent variable(s) - Medication beliefs	Age, sex, educational level, marital status	Higher necessity scores associated with increased number of medications with controlling for co-variates (0.23, 95% CI = 0.11 to 0.35, P<0.01).
Dillon & Phillips (2018) N= 1211 76.3 (SD not reported) Longitudinal Community dwelling older adults in Ireland prescribed an antihypertensive medication recruited from community pharmacies	Necessity scale - 3.65 (SD 0.69, n=1503) Concern scale - 2.17 (SD 0.60, n=1500)	Independent variable(s) - Medication beliefs Dependent variable(s) - Medication adherence	Demographics (e.g. age, gender, education, and state-funded healthcare status), health behaviors (smoking), comorbidities, medication history, multimorbidity, history of heart attack, angina and stroke, number of regular medicines, regimen complexity, number of specific antihypertensive medications, dosing frequency (e.g. once daily, twice daily etc.), combined dose of the anti-hypertensive regimen, class of antihypertensive, repackaging of medication by pharmacists into multi-dose units (MDUs)	The difference score method for assessing health beliefs was found to be inaccurate based on confirmatory polynomial regression analysis, and exploratory polynomial regression suggested that a quadratic model is the best fit for assessing the relationship between adherence and beliefs. Health beliefs should be conceptualized as a multidimensional relationship in future studies. Subjects classified as ambivalent have significantly lower adherence than subjects classified as indifferent.

Table 2.5 continued

Study Information	BMQ Results	Variables	Co-variates	Major Findings
Dillon & Phillips (2018) N= 1211 76.3 (SD not reported) Longitudinal Community dwelling older adults in Ireland prescribed an antihypertensive medication recruited from community pharmacies	Necessity scale - 3.65 (SD 0.69, n=1503) Concern scale - 2.17 (SD 0.60, n=1500)	Independent variable(s) - Financial burden Dependent variable(s) - Medication adherence	Demographics (i.e. age, gender, education), private health insurance, beliefs about medicines, health behaviors (smoking), comorbidities, medication history	Necessity and concern beliefs were a significant co-variate in the relationship between financial burden and adherence in model where adherence was measured with MMAS-8, but not in model where adherence was measured with PDC. In the MMAS-8 adjusted linear regression model, financial burden was associated with significantly lower adherence (β = − 0.29, 95% CI -0.48 to − 0.11). Over 1/3 of all patients self-reported financial burden, due to medication costs.
Fawzi (2012) N=108 61.3 (5.3) Cross-sectional Outpatients presenting for depression follow-up in Egypt	Necessity scale - Only results for individual items reported Concerns scale - Only results for individual items reported Overuse scale - Only results for individual items reported Harm scale - Only results for individual items reported	Independent variable(s) - Medication beliefs - Side-effects - Perception of patient education - Mental state Dependent variable(s) - Medication adherence	Age, sex, marital status, living arrangements, occupation, education, and medication affordability, number of psychiatric and non-psychiatric medications prescribed, dosage, duration of treatment since first prescription of antidepressant, diagnosis	Higher adherence scores significantly related to higher specific necessity scores (i.e. “my health depends on my antidepressants”) and lower specific concern beliefs (i.e. “worried about becoming dependent on antidepressants”). Higher overuse and harm scale scores were related to lower adherence scores.

Table 2.5 continued

Study Information	BMQ Results	Variables	Co-variates	Major Findings
Federman (2013) N= 420 60 (6.8) Longitudinal American patients with asthma recruited from hospital	Necessity scale - 12.9 (4.5) Concern scale - 13.5 (4.2)	Independent variable(s) - Health literacy Dependent variable(s) - Asthma perceptions and beliefs - Medication beliefs	Age, sex, race, education, income, asthma history (number of years since diagnosis, history of chronic use of oral steroids, history of intubation)	Necessity and Concern beliefs decreased over the 12-month follow-up period, but only necessity beliefs decreased significantly. Low health literacy was associated with increased concern scores (β=0.92, p=.05), and decreased necessity scores (β=−1.36, p=.01).
Hong (2019) N= 211 Mean not reported Cross-sectional American older adults with hypertension recruited from seven senior centers in a metropolitan area	Necessity scale - DNM Concern scale - DNM Overuse scale - 12.4 (2.9) Harm scale - 8.9 (2.9)	Independent Variable(s) - Informative and interpersonal patient-physician communication Dependent Variable(s) - Medication beliefs	Age, gender, education, race, household income, cohabitants, marital status, comorbidity	Overuse beliefs were significantly associated with interpersonal communication ($\beta = -0.28$, $p < 0.05$), but not informative communication. Harm beliefs were not significantly associated with interpersonal or informative communication. Higher overuse beliefs were associated with female gender ($\beta = 1.29$, $p < 0.01$) and higher education level ($\beta = 2.66$, $p = 0.02$), and higher harm scores were associated with lower income.

Table 2.5 continued

Study Information	BMQ Results	Variables	Co-variates	Major Findings
Mcloughlin (2019) N= 855 77 (5.4) Cross-sectional Irish community-dwelling patients recruited from medical practices	Necessity scale - Median: 19 (IQR: 16,22) Concern scale - Median: 11 (IQR: 9,14)	Independent variable(s) - Medication beliefs Dependent Variable(s) - Medication nonadherence	Self-esteem, life satisfaction, self-efficacy, depression, anxiety, medication reminder system, difficulty remembering, comorbidity, age, gender, social class, deprivation, education, marital status, living arrangements, health insurance, social support, activities of daily living, managing medications, social network, social functioning, vulnerability, mobility, pain, self-care, usual activities, adverse drug event, number of drug classes	Necessity beliefs were negatively associated with nonadherence ($p < .01$). A SEM models of nonadherence measured as MPR <80% resulted in no significant relationships between medication beliefs and nonadherence. A SEM model of nonadherence measured as median MPR resulted in significant direct and indirect relationships between concern beliefs and nonadherence. Indirect association between concern beliefs and nonadherence was mediated by therapy-related ($\beta = -0.04$, $p < .05$) and patient-related factors ($\beta = -0.06$, $p < .05$).
Rajpura & Nayak (2014) N=117 52.1% >65, 23.9% 55-65 Cross-sectional American patients prescribed at least one antihypertensive recruited from a senior care center	Necessity scale - 15.94 (4.48) Concern scale - 15.05 (4.52) Harm scale - 12.74 (2.20) Overuse sclae - 9.19 (3.98)	Independent variable - Medication beliefs - Illness perceptions Dependent variable(s) - Medication compliance	N/A	Adherence was significantly correlated with the differential score between necessity and concern beliefs (r=.301, P=.001), necessity beliefs (r= .250, P=.008), concern beliefs (r= .231, P= .001), and overuse beliefs (r= .342, P= .001). A combination of medication beliefs and illness perceptions predicted medication adherence (F=5.966, $P < .05$; R2=2 .212).

Table 2.5 continued

Study Information	BMQ Results	Variables	Co-variates	Major Findings
Ruppar (2012) N= 33 Median: 74 (IQR: 11.5) Cross-sectional American patients with hypertension recruited from senior centers	Necessity scale - 14.5 Nonadherent, 12.0 adherent Concern scale - Nonadherence and adherent groups: 19.0	Independent variable(s) - Medication beliefs Dependent variable(s) - Medication adherence	Age, minority status, antihypertensive dosing frequency, number of daily medications	Higher concern beliefs were significantly related to lower medication adherence. BMQ items related to medication dependency and long-term effects were also related to lower medication adherence scores. Necessity beliefs significantly predicted adherence controlling for co-variates (odds ratio: 2.027, 95% confidence interval: 1.10-3.75).
Schuz (2011) N=309 73.3 (5.1) Longitudinal Older adults with two or more diseases	Necessity scale - 3.73 (1.24) Concern scale - 2.11 (1.09) Overuse scale - 3.00 (1.01) Harm scale - 2.43 (0.99)	Independent variable(s) - Medication beliefs Dependent variable(s) - Medication adherence	Age, sex, number of illnesses, number of medications, educational status	Changes in specific necessity beliefs predicted changed in intentional nonadherence (B=-0.19, P<0.01) and changes in general overuse beliefs predicted changes in unintentional nonadherence (B=0.26, p<0.01) controlling for co-variates.
Sirey (2013) N= 299 Not reported Cross-sectional Community-dwelling older adults who required nutrition assistance	Necessity scale - Nonadherent 3.66 (0.7) - Adherent 3.73 (0.8) Concern scale - Nonadherent 2.47 (0.7) - Adherent 2.22 (0.6)	Independent variable(s) - Psychological barriers - Illness barriers - Cognitive functioning - Number of medical conditions - Disability - Tangible barriers Dependent Variable(s) - Medication Adherence	Age, race, gender, educational level	Nonadherent patients reported higher concern beliefs compared to adherent patients, but there was no difference in necessity beliefs between the groups. Both nonadherent and adherent patients reported positive necessity concern differential scores, with the differential being greater in adherent patients. Decreased necessity concern differential scores and increased difficulty opening a medication bottle were significant predictors of medication nonadherence.

Table 2.5 continued

Study Information	BMQ Results	Variables	Co-variates	Major Findings
Straβner (2020) N= 5034 74.5 (65-101) Longitudinal German patients	Necessity scale - DNM - Concern scale - DNM Overuse scale - 13.0 (4–20; 3.11); N = 4688 Usefulness scale - 16.1 (4–20; 2.48); N = 4700 Harm scale - 9.5 (4–20; 2.97); N = 4570	Independent Variable(s) - Number of drugs, prescriber, use of support with drug administration, use of medication list Dependent Variable(s) - Medication beliefs	N/A	Intentional nonadherence was related to necessity and concern beliefs, while unintentional adherence was related to only concern beliefs. Forgetfulness and carelessness related to higher concern beliefs. No relevant relationships between medication beliefs and other independent variables- number of medications, use of over-the-counter drugs, the use of a medication list.
Unni (2011) N= 1061 72.59 (5.7) and 72.4 (5.7) Longitudinal American Medicare enrollees taking at least one prescription medication recruited from an online panel	Necessity scale - 17.13 ± 4.31 vs. 17.10 ± 4.29 Concern scale - 11.70 ± 3.73 vs. 11.68 ± 3.77	Independent variable(s) - Medication beliefs - Number of medications - Insurance status - Age - Gender - Race - Education - Income Dependent variable(s) - Medication nonadherence (both intentional and unintentional	N/A	At baseline, concern beliefs, age, and income were significant predictors of overall nonadherence and intentional nonadherence in logistic regression models, while concern beliefs were the only significant predictor of unintentional nonadherence. At follow-up, concern beliefs were the only significant predictor of overall and unintentional medication nonadherence. Intentional nonadherence was significantly predicted by necessity beliefs, concern beliefs, and number of medications.

Table 2.5 continued

Study Information	BMQ Results	Variables	Co-variates	Major Findings
Unni & Farris (2015) N= 436 72.59 (5.7) and 72.4 (5.7) Longitudinal American Medicare enrollees taking at least one prescription medication recruited from an online panel	Necessity scale - 17.13 ± 4.31 vs. 17.10 ± 4.29 Concern scale - 11.70 ± 3.73 vs. 11.68 ± 3.77	Independent variable(s) - baseline adherence, baseline necessity beliefs in medicines, baseline concern beliefs in medicines, change in necessity beliefs over time, change in concern beliefs over time, change in self-reported health over time, and change in the number of medicines taken regularly over time Dependent variable(s) - change in medication adherence over two years	Age, gender, and education	Over two years, there were no statistically significant changes in necessity beliefs ($p > 0.05$), concern beliefs ($p > 0.05$), or the necessity-concern differential ($p > 0.05$). Change in adherence was significantly predicted by baseline adherence, baseline concern beliefs, change in health, and change in the number of medicines.

The results have been mixed for concern beliefs with some studies showing a statistically significant relationship between concern beliefs and adherence (Cicolini et al., 2016; Fawzi et al., 2012; McLoughlin et al., 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Sirey et al., 2013; E. Unni et al., 2015; E. J. Unni & Farris, 2011), and some studies showing no statistically significant relationship (Bae et al., 2016; Clyne et al., 2017). Results varied, at least in part, due to differences in the measurement of adherence. One study found that concern beliefs were a statistically significant predictor in models utilizing percentage of days covered, but not in models using an adherence threshold of medication possession ratio >80% (McLoughlin et al., 2019).

Other outcome variables measured in medication belief studies include number of medications (Clyne et al., 2017), health literacy (Federman et al., 2013b), disease perceptions (Federman et al., 2013b), patient-physician communication (Hong, 2019), and use of medication lists (Straßner et al., 2020).

Several longitudinal studies have been conducted measuring the medication beliefs of older adults over time (Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Federman et al., 2013a; Schüz et al., 2011b; Straßner et al., 2020; E. Unni et al., 2015; E. J. Unni & Farris, 2011). In a longitudinal study of older adults with multiple illnesses, changes in self-reported intentional and unintentional nonadherence over a period of six months were predicted by changes in medication beliefs (Schüz et al., 2011b). A separate study specifically examined the relationship between medication beliefs and different forms of unintentional nonadherence. Results of the longitudinal investigation over a two-year period found that concerns about medications were statistically significant predictors of self-reported forms of unintentional nonadherence, such as forgetfulness and carelessness (E. J. Unni & Farris, 2011). Longitudinal studies have found little to no changes in concern beliefs over time, but one study found a significant decrease in necessity beliefs in a 12-month period (Federman et al., 2013b).

Variations in measurement of adherence also continue to impact results in longitudinal studies. One study found that necessity and concern beliefs were a significant co-variate between financial burden and adherence only in models where self-reported adherence was utilized, and not in measures utilizing percentage of days covered (Dillon, Smith, et al., 2018).

2.3.1 Measurement

The BMQ was developed through a collaboration between pharmacy and psychology researchers. It consists of 18 items over two sections: the BMQ-Specific and the BMQ-General. The BMQ-Specific includes two factors (Necessity and Concern) that specifically relate to medications that the patient has been prescribed. Examples of items in this section include: "My health, at present depends on my medicine," and "My medicine disrupts my life." These items are rated on a 5 point Likert scale from strongly agree to strongly disagree. The BMQ-General has two factors (Overuse and Harm) that are related to an individual's beliefs about medications in general. Examples of items in this section include: "Doctors use too many medicines," and "Medicines do more harm than good." These items are rated on a 5 point Likert scale from strongly agree to strongly disagree. The BMQ has been cited by nearly 800 articles since original publication and is directly linked to medication adherence (Granås & Bates, 2005; Okuno et al., 1999).

While the BMQ is established as the gold-standard for measurement of medication beliefs, there continues to be some disagreement about the best method for utilizing BMQ scores. Dillon et al. conducted a longitudinal study in older adults (N=1211) in Ireland to explore the validity of different methods of analyzing medication beliefs (Dillon, Phillips, et al., 2018). Confirmatory polynomial regression calls into question the validity of utilizing the differential between necessity and concern beliefs as a proxy for medication beliefs. Exploratory polynomial regression suggests the use of a multidimensional quadratic model when assessing the relationship between adherence and beliefs (Dillon, Phillips, et al., 2018). The results from this study provide additional support for separating medication beliefs into four subgroups: ambivalent (high necessity beliefs and high concern beliefs), accepting (high necessity and low concern beliefs), indifferent (low necessity and low concern beliefs), and skeptical (low necessity and high concern beliefs). The authors suggest that future work consider utilizing these four groups instead of a differential between necessity and concerns beliefs when sample sizes allow (Dillon, Phillips, et al., 2018).

2.3.2 Gap

The majority of past work measuring medication beliefs in older adult populations has been focused on the relationship between medication beliefs and medication adherence. There is

significant evidence to support that beliefs play a substantial role in older adults' adherence to medications.

However, less work focuses on predictors of medication beliefs in the older adult population. Since medication beliefs have been established as an essential predictor of medication adherence, more work is needed to determine what other patient characteristics are related to medication beliefs. Interventions targeting medication beliefs have been suggested repeatedly in past research, but no past studies specifically measure the outcomes of such interventions. Additional work looking at other correlates to medication beliefs is needed to develop future intervention targets in older adults.

Finally, there are no known studies to date, specifically assessing the relationship between medication knowledge and beliefs of elderly patients. Although medication beliefs have been studied longitudinally, beliefs and knowledge have not been evaluated concerning the timing of specific medication events, such as: medication prescribing, medication dispensing, or medication administration.

2.4 Summary of Medication Outcomes in Older Adults

Medication knowledge and beliefs may serve as potential intervention targets to improve medication adherence in older adults (Sweileh, 2014). There is significant variation in medication knowledge scores in previously studied samples of older adults. This variation is due to major differences across studies in how medication knowledge is conceptualized and measured (Dickinson & Raynor, 2003). There is no consensus about what specific domains should be included in measures of medication knowledge, and clinical consensus about important medication knowledge questions has been largely ignored by previous work. The link between medication knowledge and clinical outcomes has been severely limited due to these inconsistencies in knowledge measurement.

Medication beliefs have been measured reliably through the use of the BMQ in samples of older adults. Necessity and concern beliefs have been consistently linked to medication adherence (Bae et al., 2016; Cicolini et al., 2016; Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Fawzi et al., 2012; McLoughlin et al., 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Schüz et al., 2011a; Sirey et al., 2013; E. Unni et al., 2015; E. J. Unni & Farris, 2011). Although

medication knowledge and medication beliefs have been correlated to medication adherence, the relationship between medication knowledge and beliefs remains unexplored.

Finally, very little work addresses ways in which medication beliefs may be altered or influenced though intervention. The same is true of medication knowledge. Project PROMISE aims to link medication knowledge and beliefs to one potential predictor of these outcomes: patients' decisions about seeking and avoiding medication information. Past work focused on patient's medication information management behaviors (i.e. the use of specific strategies to manage medication information needs, including direct information seeking, indirect information seeking, information avoidance, and cognitive reappraisal) is summarized below.

2.5 Medication Information Management Behaviors (MIMB)

MIMB across all portions of the medication use process will be briefly considered in the following review. Medication use has been described as a four-step process (Nadzam, 1991): 1) prescribing, 2) preparing and dispensing, 3) administering, and 4) monitoring. Medication information can be sought by patients or provided by healthcare providers at any point during the use of medications. Although it has not been previously studied, it may also be possible for patients to navigate the entire medication use process without ever receiving direct information about their medication. Lack of congruence among healthcare providers about which discipline is responsible for medication information provision puts patients at higher risk for receiving limited or no medication information (Auyeung et al., 2011b).

First, information exchange between physicians and patients will be reviewed by focusing on the medication prescribing phase of the process. This phase has been identified as the time that patients and physicians are most likely to discuss information relevant to medications. Next, information exchange between pharmacists and patients will be summarized by focusing on communication that occurs during medication dispensing. Medication dispensing may occur longitudinally throughout the medication use process, both before the first administration and during monitoring. While pharmacist time with patients may be less per encounter than that of physicians, pharmacists see patients approximately seven times more than physicians do (Patel et al., 2019). With this level of contact, pharmacists have the opportunity to build relationships with patients over time, which may impact adherence and other health outcomes.

Finally, the administration and monitoring phases will be considered. A variety of healthcare providers may discuss medications with patients during these phases, and patients may seek out information from other sources, such as the print literature, the internet, or friends and family.

2.5.1 Medication Information Management Behaviors (MIMB) During Prescribing

Patients report poor information provision by physicians at the time medications are prescribed (Feng et al., 2011; Morris et al., 1997; Louis A. Morris, 1982). These reports have also been confirmed by research studies utilizing direct observation. In these studies, physicians most frequently provided information on the purpose of the medication, favoring these explanations over the specific medication name. Physicians were much less likely to discuss administration instructions, and least likely to discuss side effects of the medications (Tarn et al., 2009).

Physicians also were more likely to discuss the effectiveness of treatment, in comparison to limitations of treatment. Physicians discussed effectiveness in 45% of encounters. The three least frequently discussed aspects of medication use were: patients' adherence-related self-efficacy (i.e. belief that one can effectively achieve behavior essential to adherence), seriousness of the condition for which the medication was prescribed, and negative effects of treatment. One-third of all encounters did not include discussion of any aspect of medication treatment (Feng et al., 2011). In particular, information provision regarding medication side effects and risks were inconsistent. Providers' reluctance to discuss side effects has been attributed to the perception that risk information might lead to increased nonadherence (Nair et al., 2002). Although there is evidence that providers' provision of medication information has increased slightly over the last several decades (Tarn et al., 2009), the amount of information about medications that is provided to patients during medication prescribing continues to be limited (Feng et al., 2011).

Based on the literature, there is a lack of effective communication about medications between physicians and patients. Little agreement between physicians and patients exists about what information is important, who should provide information, or when medication information should be communicated (Auyeung et al., 2011a; Wilson et al., 2007). This lack of agreement is especially pertinent in older adults, who take more medications than any other age group, receive the least amount of information (Harris et al., 2002b), and are more vulnerable to negative

outcomes from risks of medications (Committee on Health Literacy, Board on Neuroscience and Behavioral Health, 2004).

2.5.2 Medication Information Management Behaviors (MIMB) During Dispensing

Community pharmacy practice has undergone significant changes in the last four decades. While revealing any information to a patient about their medication was considered unethical in the past, today the provision of medication information is both legally and professionally mandated (Coleman, 2003; Young, 1996). Although legal requirements for medication counseling have been in place for more than a decade, implementation of pharmacist counseling is inconsistent across community settings (Roberts et al., 2006). Many patients purchase prescriptions without interacting with a pharmacist, including in states where an offer to counsel is required by law.

The literature clearly documents an unmet patient need for medication counseling (Beuscart, 2019; Paluck et al., 2003; Pronk et al., 2002), yet few patients take the opportunity to ask questions or seek medication-related information from the pharmacist at the time of medication dispensing (Krueger & Hermansen-Kobulnicky, 2011). Similarly, pharmacists do not always take the opportunity to actively provide counseling about new medication regimens (Young, 1996). Estimates of the verbal communication occurring between pharmacists and patients are often below 50% (Cavaco & Romano, 2010; Coleman, 2003; Greenhill et al., 2011; Kimberlin, 2006; Schommer & Wiederholt, 1995; D. H. Smith et al., 2009; Svarstad et al., 2004; Tully et al., 2011).

Frequency of communication has shown little improvement since the 1970s, when pharmacists were "allowed" the right to speak to patients about medications, and the first research on pharmacist-patient communication was published (Young, 1996). Although some have attributed these low rates of communication to lack of patient demand for information (Puspitasari et al., 2009), when surveyed, over 90% of patients said they desire medication information from a pharmacist at the time of medication dispensing (Krueger & Hermansen-Kobulnicky, 2011).

The literature on pharmacist counseling over the last four decades falls into two major categories: descriptive studies and studies testing the mediators and moderators of pharmacist counseling. Descriptive studies often focus on the frequency, length, and content of pharmacist counseling. In one study, 80% of patients either reported not being counseled during the first dispensing of a new medication or being dissatisfied with the information received (Paluck et al., 2003). In follow-up phone calls to patients who were new users of medication, patients reported

never having experienced any type of counseling, as described by the interviewers (Geffen et al., 2011). While medication information is not given voluntarily to a majority of patients picking up prescriptions (Paluck et al., 2003), pharmacists seem willing to provide information in response to patient needs and requests (Geffen et al., 2011). However, when pharmacists take the opportunity to counsel patients about medications, they often control the conversation with closed-ended questions and one-way provision of information (Cavaco & Romano, 2010). Overall, pharmacists provide less than one minute of counseling for less than half of patients that enter their pharmacies (Krska, 2011; Young, 1996).

Factors influencing the occurrence of pharmacist counseling include those pertaining to pharmacists, patients, and the environment. Pharmacist factors (i.e. years in practice, job satisfaction, and self-efficacy) have been investigated by nearly twice the amount of studies as compared to patient factors (i.e. number of medications, trust in providers, and previous knowledge about the medication) and environmental factors (i.e. pharmacy business, workflow, and setting) (Ascione et al., 1985a; Baldwin et al., 2008; Coleman, 2003; DeLorme et al., 2011; Kaae et al., 2012; Kimberlin, 2006; Paluck et al., 2003; Ranelli & Coward, 1996; Simmons-Yon et al., 2012; S. R. Smith et al., 2004; Svarstad et al., 2004). Significant predictors of medication counseling are summarized in Table 2.6. Few studies have utilized a theoretical approach to identify mediators and moderators of medication information exchange. Lack of consensus about the predictors of medication counseling exists in the community pharmacy environment, resulting in lack of a unified research direction. Communication research and theory has not been used to ground and direct research regarding patient counseling and information exchange.

While there has been a growing interest in conducting research on communication between healthcare providers and patients, few studies have drawn on the communication literature to address communication barriers between healthcare providers and patients (Shah & Chewning, 2011). The pharmacy communication literature often focuses on a one-way transmission of information from provider to patient, rather than the conceptualization and measurement of two-way information exchange (Shah & Chewning, 2011). This provider-centric research is in contrast to the current health landscape that often relies on patients to initiate conversations about medications, ask questions, and relay concerns on their own initiative.

Table 2.6: Factors Found to Significantly Influence Pharmacy Counseling in Previous Literature

Significant Factor of Pharmacy Counseling	Factor Category
age	Pharmacist Factor
subjective norms	Pharmacist Factor
perceived patient expectations	Pharmacist Factor
lack of knowledge about patient	Pharmacist Factor
job satisfaction	Pharmacist Factor
autonomy	Pharmacist Factor
perceived skill	Pharmacist Factor
credibility	Pharmacist Factor
approachability	Pharmacist Factor
attitude towards counseling	Pharmacist Factor
years in practice	Pharmacist Factor
adherence expectations	Pharmacist Factor
outcome expectations	Pharmacist Factor
perceived importance of information	Pharmacist Factor
role orientation	Pharmacist Factor
physically handing prescription to patient	Pharmacist Factor
perceived efficacy of counseling	Pharmacist Factor
“comfort level” with counseling	Pharmacist Factor
age	Patient Factor
ethnicity	Patient Factor
income	Patient Factor
gender	Patient Factor
perceived usefulness of information	Patient Factor
“passivity” / lack of initiative	Patient Factor

Significant Factor of Pharmacy Counseling	Factor Category
level of interest in counseling	Patient Factor
question-asking behaviors	Patient Factor
role orientation	Patient Factor
amount of information received from MD	Patient Factor
previous knowledge about medication	Patient Factor
number of medications	Patient Factor
trust in physician	Patient Factor
embarrassment	Patient Factor
lack of time	Environmental Factor
pharmacy busyness	Environmental Factor
intensity of state regulations	Environmental Factor
technician/ pharmacist ratio	Environmental Factor
type of medication/ medication class	Environmental Factor
first or refill medication	Environmental Factor
workflow	Environmental Factor
walk-in vs. drive through	Environmental Factor
rural vs. urban pharmacy	Environmental Factor
available resources	Environmental Factor
privacy of prescription pick-up	Environmental Factor

In 1985, researchers surveyed patient education activities in community pharmacists and summarized their findings by saying, "Consumers who are aggressive in seeking prescription drug information... will likely receive the answers they need. Because the typical...interaction seems to inhibit the patient's willingness to ask questions (Asicone et al., 1985)." Evidence suggests that this phenomenon has not changed significantly over the last 30 years. If patients are expected to initiate healthcare conversations, more research is needed to understand why patients choose to seek or avoid information from healthcare providers. Limited work has been done to explore patients' attitudes about medication information seeking, and no known studies have examined medication seeking over time. As a result, factors that influence patients' attitudes over time are unknown.

2.5.3 Medication Information Management Behaviors (MIMB) During Administration and Monitoring

Communication between healthcare providers and patients after the initial dispensing of the medication has rarely been studied. Patients may never discuss a chronic medication directly with their physician after initial prescribing, unless a major change in health status occurs or the patient experiences difficulties with the medication. In addition, pharmacists are less likely to counsel patients on refill medications, when compared to initial medication dispensing (Guirguis, 2011a).

Older adults' hesitation to discuss problems with medication administration with healthcare providers contributes to this communication gap (Harris et al., 2002b). In a national sample of older adults, nearly a third of nonadherent patients had not reported skipping doses or discontinuing medications to their physician. Medication nonadherence was even higher for patients who reported that their nonadherence was due to cost concerns (Wilson et al., 2007). A separate study similarly found that patients react to cost concerns by decreasing medication use on their own instead of contacting a healthcare provider to receive advice or assistance (Tseng et al., 2007). Although more work needs to be completed in this area, pharmacists have the opportunity to play an important role in information provision during this phase of medication use due to their accessibility and increased contact with patients. In addition to counseling during medication dispensing, some pharmacists also play a role in providing medication therapy management (MTM)

and yearly comprehensive medication reviews (CMR) for high risk older adults patients through contracts with Medicare Part D and other insurance groups (Corsi, 2018).

2.6 Potential Utility of Information Seeking Models in Medication Use Context

The information seeking literature seeks to explain how individuals make decisions about their information needs. This literature is especially pertinent to medication use due to its focus on risk information. As previously discussed, medications include inherent risk of adverse drug reactions, morbidity, and mortality (Morris et al., 1992). It is also known that the most frequently desired information for prescriptions, whether new or refill medications, is risk information (i.e. information about interactions, contraindications, warnings etc.). Several risk information seeking models were reviewed for potential application to the medication use process. Theories considered include: the Extended Parallel Processing Model (EPPM; Witte,1998), the Risk Information Seeking and Processing Model (RISP; Griffin, Dunwoody, & Neuwirth, 1999), the Planned Risk Information Seeking Model (PRISM, Kahlor, 2010), and the Theory of Motivated Information Management (TMIM; Afifi & Weiner, 2004).

2.6.1 Extended Parallel Process Model (EPPM)

The EPPM is an early model that allowed for both adaptive and maladaptive changes when exposed to a risk. In the EPPM, message components lead to perceived efficacy and perceived threat. These perceptions either lead to protection motivation and adaptive changes or lead to defensive motivation through fear and maladaptive changes (Witte, 1992).

2.6.2 Risk Information Seeking and Processing Model (RISP)

The RISP model is based on the construct of information sufficiency, or the gap between the amounts of information a person wants to know and currently knows. Individual characteristics and perceived hazard characteristics influence affective response and informational subjective norms, which in turn influence information sufficiency. Information sufficiency influences the type information seeking and processing behavior and is mediated by relevant channel beliefs and perceived information gathering capacity (Griffin, Dunwoody, & Neuwirth, 1999).

2.6.3 Planned Risk Information Seeking Model (PRISM)

The PRISM model builds on and combines previous models to try to generalize the information seeking process. Constructs include attitude towards seeking, risk perception, affective risk response, seeking-related subjective norms, perceived knowledge, perceived knowledge insufficiency, and perceived seeking control. All of these constructs together lead to seeking intent (Kahlor, 2010). Because this is a newer model, the complex relationship between these constructs is not yet well understood or studied.

2.6.4 Theory of Motivated Information Management (TMIM)

The TMIM is unique in that it is specific to interpersonal information seeking and allows for the influence of both the information seeker and the information provider. This model has three distinct phases in terms of information management including the interpretation phase, the evaluation phase, and the decision phase. The information seeker has a certain level of uncertainty discrepancy that may produce anxiety. Anxiety may influence the evaluation phase where information seekers make outcome and efficacy assessments. These assessments in turn affect the information management system chosen by the information seeker; seeking relevant information, avoiding relevant information, or cognitive reappraisal (W. A. Afifi & Weiner, 2004).

2.6.5 Comparing Risk Information Seeking Models to Previous Pharmacy Literature

Because the primary focus of this study was information seeking during medication dispensing, factors from previous literature that influence pharmacist counseling were compared to theoretical constructs in each of these theories (see Table 2.7) (Ascione, Kirking, Duzey, & Wenzloff, 1985; Baldwin, Cvengros, Christensen, Ishani, & Kaboli, 2008; Coleman, 2003; Dastani, 2004; DeLorme et al., 2011; Halton, 2009; Kaae, Trailsen, & Norgaard, 2012; Kimberlin et al., 2011; Paluck, Green, Frankish, Fielding, & Haverkamp, 2003; Ranelli & Coward, 1996; Schommer & Wiederholt, 1997; 2007; Simmons-Yon et al., 2012; Smith et al., 2004; Svarstad, Bultman, & Mount, 2004; Tarn, Paterniti, Wenger, Williams, & Chewning, 2012; Tully et al., 2011; Vainio, Airaksinen, Hyykky, & Enlund, 2002).

Although all of the models had significant and useful constructs that may have been considered, and every model had at least one construct that had been explored in previous literature,

some models showed deficiencies when applied to the case of pharmacist counseling. The EPPM's most positive aspect is the allowance of maladaptive behaviors. However, EPPM is lacking many of the important constructs that other models include such as outcome assessments.

Table 2.7. Mapping the Pharmacy Literature onto Risk Information Seeking Models

Construct	Model(s)	Supporting Literature
Message Components	EPPM	none
Perceived Efficacy	EPPM	pharmacist perceived skill for counseling
Perceived Threat/ Hazard Characteristics/ Risk Perception	EPPM/ RISP/ PRISM	none
Protection Motivation	EPPM	none
Defense Motivation	EPPM	none
Fear/ Anxiety/ Affective Risk Response	EPPM/ TMIM/ RISP / PRISM	none
Relevant Hazard Experience	RISP	none
Political Philosophy	RISP	none
Demographic/ Sociocultural Factors	RISP	age/ ethnicity/ income/ gender
Relevant Channel Beliefs	RISP	pharmacist credibility and approachability
Perceived Information Gathering Capacity	RISP	none
Information Sufficiency/ Uncertainty Discrepancy	RISP/ TMIM/ PRISM	previous knowledge about medication, amount of information received from doctor about medication
Informational/ Seeking-related Subjective Norms	RISP/ PRISM	regulatory status
Outcome Assessments	TMIM	pharmacist outcome expectations
Efficacy Assessments	TMIM	pharmacist perceived skill for counseling, pharmacist credibility and approachability
Attitude Towards Seeking	PRISM	pharmacist attitude towards counseling
Perceived Knowledge	PRISM	previous knowledge about medication, amount of information received from doctor about medication
Perceived Seeking Control	PRISM	busyness of pharmacy

Based on previous research, both the RISP and the PRISM have constructs that may be applicable to the community pharmacy setting based on past literature. However, PRISM ends at the construct "seeking intent" and RISP's central construct is "information sufficiency." Already well-documented in the literature is a large unmet need for medication information from the patient perspective. Therefore, this appears to not be the main or only cause for the information avoidance that is seen in clinical practice. Instead of ending with intent or information sufficiency, TMIM begins with uncertainty discrepancy, and provides explanation for the process between uncertainty and the actions of information management. This may allow the discovery of intervening factors that prevent patients from seeking information even when their uncertainty discrepancy is high.

2.7 Evaluation of the Theory of Motivated Information Management

The TMIM was first proposed in 2004 by William Afifi and builds on a wide range of previous theories including: Social Cognitive Theory (Bandura et al., 1999), Uncertainty Management Theory (Brashers, 2001), and Problematic Integration Theory (Babrow, 2001). The TMIM's main aim is to describe the internal mechanisms by which people choose to seek out or avoid information, and the theory proposes three distinct phases of uncertainty management including: the interpretation phase, the evaluation phase, and the decision phase. The interpretation stage is unique to information seekers, while both information seekers and information providers engage in the interpretation and evaluation phases. Seekers and providers can affect each other in cyclic fashion though these phases. The cycle begins for information seekers when they experience uncertainty discrepancy, which is the difference between the amount of uncertainty (i.e. a cognitive state when the meaning or probability of an event is unknown due to insufficient or inconsistent information) the seeker wants, and the amount of uncertainty the seeker currently has (Afifi & Weiner, 2004).

From the information seeker's perspective, uncertainty may be higher or lower than the desired level. The magnitude of discrepancy between the desired and actual level of uncertainty creates anxiety, and this anxiety may in turn influence the evaluation phase. In the evaluation phase, seekers make outcome and efficacy assessments which include: outcome expectancies (expectations about specific outcomes of seeking or avoiding information), coping efficacy (extent to which the seeker has the resources to use information given to them), communication efficacy

(the extent to which the seeker feels able to communicate with the target), and target efficacy (how willing and able the target is to communication the information to the seeker) (Afifi & Afifi, 2009).

Information providers enter the process when they become aware of the seekers need for information and engage in the same outcome and efficacy assessments seekers. These assessments, for both information seekers and information providers, affect the information management system chosen: seeking/providing relevant information, avoiding relevant information, or cognitive reappraisal. Although the conceptual understanding of the information provider is not well understood, the TMIM is particularly unique in that it allows for the influence of both the information seeker and the information provider in the exchange.

The TMIM has been citied in over 500 articles since publication and tested in a variety of contexts. Contexts in which TMIM has been studied vary widely including: chronic illness (Checton et al., 2012), caregiving for the elderly (Fowler 2011), parental relationships (Afifi & Afifi, 2009), sexual health (Afifi & Weiner, 2006), organ donation (Afifi et al., 2006), uncertainty in close relationships (Jang & Tian, 2012), and medication management services (Carter et al., 2012a, 2012b). A summary of selected studies testing the TMIM in health-focused contexts are provided in Table 2.8 (Checton et al., 2012; Fowler & Afifi, 2011; Heminger & Lynch, 2014; Hovick, 2013; Lewis & Martinez, 2014; Lillie, 2015; Lindley & K., 2015; Rauscher & Hesse, 2014; Rauscher, 2015; Wong, 2014).

A 2020 meta-analysis of 33 empiric studies of TMIM constructs published in the last 15 years demonstrated good model fit and overall support for the bivariate relationships between TMIM constructs, as originally proposed by the theory (Kuang & Wilson, 2020). Two potential differences in hypotheses that are suggested for future research are the direct relationship between uncertainty discrepancy and information-seeking, and the direction of that relationship (Kuang & Wilson, 2020). The meta-analysis specifically focused on issue importance and age as potential moderators of TMIM relationships, and found that age was a significant moderator, while issue importance only trended towards significance. However, the review also highlights the lack of diversity in previous study samples where the majority of past participants were European American and college-aged students (Kuang & Wilson, 2020).

Table 2.8. Selected Studies Testing the TMIM in the Health/ Illness Context

Study	Type of Analysis	Context	N	TMIM Constructs Tested	Results
Checton 2012	Cross-sectional	Patients' and partners' perspectives on chronic illness	308 dyads	Uncertainty and communication efficacy	Uncertainty did not significantly predict communication efficacy, however illness interference did. Communication efficacy predicted illness management behaviors.
Fowler 2011	Cross-sectional	Adult children's discussions of caregiving for aging adults	127	Uncertainty discrepancy, emotional responses, anxiety, outcome expectancies, efficacy, information-seeking behavior	Supported link between uncertainty and negative emotional responses, emotional response and outcome expectancies, outcomes expectancies and efficacy judgments. Communication efficacy only efficacy to be significant predictor of information-seeking behavior. Revised model with space for wider range of emotional responses produced overall better fit.
Heminger 2014	Cross-sectional	Breast cancer	990	Uncertainty discrepancy, anxiety, outcome expectancies, Information seeking efficacy, Information management strategy	A majority of proposed TMIM structural paths were significant. There was no direct effect of target efficacy on information management, but target efficacy mediated the relationship of outcome expectancies and information management.

Table 2.8. continued

Study	Type of Analysis	Context	N	TMIM Constructs Tested	Results
Hovick 2013	Cross-sectional	Family health	306	Uncertainty discrepancy, anxiety, outcome expectancies, efficacy, intention to seek information	Uncertainty discrepancy increased intentions to seek information from family members. Target efficacy was removed from the model due to multicollinearity. Communication efficacy performed as predicted by TMIM, but coping efficacy did not.
Lewis & Martinez 2014	Cross-sectional	Breast, prostate, and colorectal cancer	2013	Communication efficacy	Communication efficacy positively associated with cancer-related information seeking
Lillie 2015	Cross-sectional	General health	45	Logistical uncertainty, illness uncertainty, outcome expectations, target efficacy, communication efficacy	Communication efficacy and outcome expectations significantly related to help-seeking for Chinese international students.
Lillie 2015	Cross-sectional	General health	361	Logistical uncertainty, illness uncertainty, outcome expectations, target efficacy, communication efficacy	Uncertainty discrepancy significantly related to help-seeking for domestic students.

Table 2.8. continued

Study	Type of Analysis	Context	N	Constructs Tested	Results
Lindley 2015	Cross-sectional	Mental health	197	Uncertainty discrepancy, anxiety, outcome expectancy, efficacy, information-seeking tendency	Anxiety was not related to efficacy. Outcome expectations positively related to efficacy, and efficacy positively related to direct information seeking.
Ohs 2008	Longitudinal	Healthcare decision making	62	Communication efficacy, target efficacy, coping efficacy, information seeking behavior	Communication efficacy directly predicts information seeking. Coping efficacy indirectly predicts information seeking, and that relationship is mediated by communication efficacy. Target efficacy was not significantly related to information seeking.
Rauscher & Hesse 2014	Cross-sectional	Family health	297	Uncertainty discrepancy, anxiety, negative emotions, outcome expectancies, efficacy, information seeking	Uncertainty discrepancy predicted anxiety, outcome expectancies predicted efficacy, and efficacy predicted information seeking across all models. Coping efficacy not a significant predictor of information seeking. Additional positive and negative emotions beyond anxiety predicted information seeking behaviors.

Table 2.8. continued

Study	Type of Analysis	Context	N	Constructs Tested	Results
Rauscher 2015	Cross-sectional	Genetic cancer risk	183	Uncertainty discrepancy, anxiety, outcome expectancies, efficacy assessments, information exchange	Uncertainty discrepancies predicted anxiety, and anxiety predicted efficacy and outcome assessments. There was no direct relationship between outcome and efficacy assessments.
Wong 2014	Cross-sectional	HPV	215	Uncertainty discrepancy, anxiety, outcome expectancy, efficacy, information-seeking intent	Positive outcome expectancies and anxiety directly predicted information seeking intent.

Despite the large number of past studies utilizing TMIM, there continues to be no standardized way of conceptualizing or measuring information-seeking behavior. While some studies have attempted to measure information seeking experimentally, others have studied past information seeking behaviors, and willingness to seek information in the future (Carter et al., 2012b, 2015). These differences may influence the performance of the theory. Kuang et. al. suggest that a majority of past work has been focused solely on direct information seeking, and future studies should consider expanding information management behaviors to include predictors of information avoidance and cognitive reappraisal.

One of the most common differences between empirical studies is the measurement and role of efficacy in information seeking. The TMIM includes three types of efficacy in relation to information seekers: target efficacy, communication efficacy, and coping efficacy. Communication efficacy has been studied more than any other construct in the theory in recent years and has the most empirical support than the other types of efficacy in terms of influencing information seeking behavior. Target efficacy and coping efficacy have been studied less often, and results have been mixed when they have been studied.

Measurement problems were reported regarding target and coping efficacy in several studies, but the evidence is not conclusive enough to eliminate these factors from the theory to date (Kuang 2020). Until a consistent, standardized measurement of target and coping efficacy can

be identified, researchers should continue to include these factors when applying the theory to new contexts (Afifi et al, 2014). The difficulty of measuring target efficacy may also be in part to the current lack of understanding of how differences in contexts such as close relationships, family communication, or health information-seeking influence the overall TMIM model (Kuang & Wilson, 2020).

A summary of TMIM based studies focused specifically on medications is presented in Table 2.9 (Carter et al., 2012a, 2010b, 2013a, 2013b, 2015; DeLorme et al., 2011; Huston, 2013; Thiel, 2017; Williams, 2013). A majority of published studies have focused on patients' motivation and willingness to use home medicines review (HMR) in Australia (Carter et al., 2012a, 2012b, 2013a, 2015). Other studies have focused on medication information source selection (i.e. information seeker's decisions about where and how to get information to address a perceived need) across a variety of sources (DeLorme et al., 2011) or specifically on information from pharmacists (Huston, 2013). A single published study (Carter et al., 2013b) and a single unpublished dissertation (Thiel, 2017) focused on medication adherence. These adherence studies are the only known TMIM based studies that focus on outcomes of MIMB.

Uncertainty discrepancy (i.e. the difference between how much an individual desires to know and actually knows about a topic) has been conceptualized in a variety of alternate ways including information insufficiency threshold (Williams, 2013) and knowledge held and knowledge needed (Huston, 2013). Study results were mixed. Information insufficiency was positively correlated with information seeking (Williams, 2013), but knowledge held and knowledge needed did not predict information seeking (Huston, 2013). When measured as the original theoretical construct, uncertainty discrepancy was only indirectly related to information seeking (Thiel, 2017).

Positive outcome expectancies have been studied more frequently than negative outcome expectancies and positively predicted information seeking across all studies (Carter et al., 2012a, 2013a, 2015; Thiel, 2017). Worry and anxiety were directly related to information seeking in one study (Carter et al., 2013a), but were more likely to only indirectly predict information seeking (Carter et al., 2013b; Thiel, 2017).

Table 2.9. Selected Studies Testing the TMIM in the Medication Context

Study	Type of Analysis	Context	N	Constructs Tested	Results
Carter 2012a	Cross-sectional survey	Patients' willingness to use medication management service	286	Outcome expectancy, communication efficacy, willingness	Positive outcome expectancies and communication efficacy significantly predicted willingness to participate, but negative outcome expectancies did not predict willingness.
Carter 2012b	Semi-structured focus group interviews	Patients' motivation to participate in Australia's home medicines review program	80	Medication worry, outcome expectations	Participants with positive outcome expectancies were more motivated to participate in home medicine review. Overall, participants provided more information about positive outcome expectations than about medication worry, and medication worry also appeared to decrease with age.
Carter 2013a	Cross-sectional survey	Consumer willingness to use home medication reviews	390	Medication-related worry, Outcome expectancy, communication efficacy, willingness	Positive outcome expectancies had a strong influence on willingness, while communication efficacy had a moderate effect. Worry had a moderate effect on outcome expectancies and an indirect impact on willingness.

Table 2.9. continued

Study	Type of Analysis	Context	N	Constructs Tested	Results
Carter 2013b	Cross-sectional survey	Medication adherence	910	Medication information seeking behavior, medication-related worry	Patients with increased medication-related worry or changes in the previous 3 months were more likely to seek medication information. Those seeking information from autonomous sources were more likely to be nonadherent. Seeking from healthcare professionals did not impact adherence.
Carter 2015	Cross-sectional survey	Willingness to re-use home medicines review	595	Positive outcome evaluations, communication efficacy, willingness	Past perception of pharmacy communication behaviors predicts positive outcome evaluations, which predict increased willingness to participate in home medicines review.
DeLorme 2011	Cross-sectional survey	Source selection in prescription drug information	224	Perceived importance of prescription drug information, perceived usefulness of specific sources, information seeking actions	Income and number of drugs taken positively predicted the perceived usefulness of interpersonal sources. Perceived usefulness of interpersonal sources did not impact the use of interpersonal sources, but age and gender directly predicted use of interpersonal sources.

Table 2.9. continued

Study	Type of Analysis	Context	N	Constructs Tested	Results
Huston 2013	Cross-sectional, online survey	Intentions to seek medication information from pharmacists	187	Perceived knowledge held, perceived knowledge needed, medication information–seeking attitude, likelihood of seeking information from a pharmacist	Knowledge held and needed was not a significant predictor of intention to seek information from a pharmacist after accounting for affective and evaluative attitudes and other variables. Intention to seek information increased significantly after being asked about their self-perceived knowledge of their medication.
Thiel 2017	Cross-sectional, online survey	Treatment adherence	76	Uncertainty, emotion(s), outcome expectancies, and efficacy assessments	Uncertainty discrepancy significantly predicted anxiety. Anxiety had a significant relationship with negative efficacy assessments. Outcome and efficacy assessments significantly predicted information seeking from a physician. Relatively low discrepancy levels within the sample.
Williams 2013	Cross-sectional, online survey	Risk information seeking about a newly discovered drug risk	259	Information sufficiency threshold, affective response, perceived information gathering capacity, channel beliefs, information seeking and processing	Positive relationship between information insufficiency and information seeking. No relationship between channel beliefs validity. No significant relationship between information gathering capacity and information seeking.

Communication efficacy is the most frequently studied type of efficacy (Carter et al., 2012a, 2013a; Thiel, 2017) and was positively correlated with MIMB. Mixed results have been seen with target efficacy with one study showing a direct effect on information management systems (Thiel, 2017), but others showing that items related to target efficacy did not predict information management (Williams, 2019; DeLorme et al., 2011). Past experiences with an information target (specifically pharmacists listening skills) also predicted future willingness to seek information from an information source (Carter et al., 2015). Coping efficacy has not been studied in contexts specific to medication.

2.8 Summary of the Literature and Conceptual Framework

The conceptual framework used for this study is summarized in Figure 2.1. In this framework, elderly patients' medication information management behaviors (MIMB) are influenced by their attitudes about seeking medication information. Information seeking attitudes included in the framework are listed below and defined in Table 2.10.

- Perceived level of certainty about the topic of information seeking (i.e. uncertainty discrepancy)
- Negative emotions associated with uncertainty (i.e. anxiety)
- Attitudes about the information seeking process (i.e. outcome assessments)
- Perceived ability to seek information from specific sources (i.e. efficacy assessments)

Patients' MIMB are the ways in which patients choose to manage their need for medication information. Patients may choose to directly seek medication information (e.g. a patient asks a provider a direct question about a medication), indirectly seek medication information (e.g. a patient initiates a conversation with a healthcare provider in hopes that they will provide more information about a medication), avoid medication information (e.g. a patient directly refuses a healthcare provider's offer to answer questions about a medication, when in reality that patient still has remaining questions), or change their perceptions of their need for medication information (e.g. a patient reminds themselves that a healthcare provider probably would have told them more about a medication if it was important, and decides they don't need to seek more information). These MIMBs influence: medication knowledge, medication beliefs, and ultimately medication adherence. The framework also suggests that MIMBs may directly impact information seeking attitudes, which then predispose patients to choose a particular MIMB in future interactions.

There are significant communication gaps between healthcare providers and patients across the entirety of the medication use process. Pharmacists are uniquely suited to address these gaps due to the accessibility of community pharmacists and the frequency of contact between community pharmacists and patients. However, a majority of patients refuse offers to receive information about their medications in these settings. The TMIM will be used to explore potential explanations for patients' decisions about seeking and avoiding information in the community pharmacy setting.

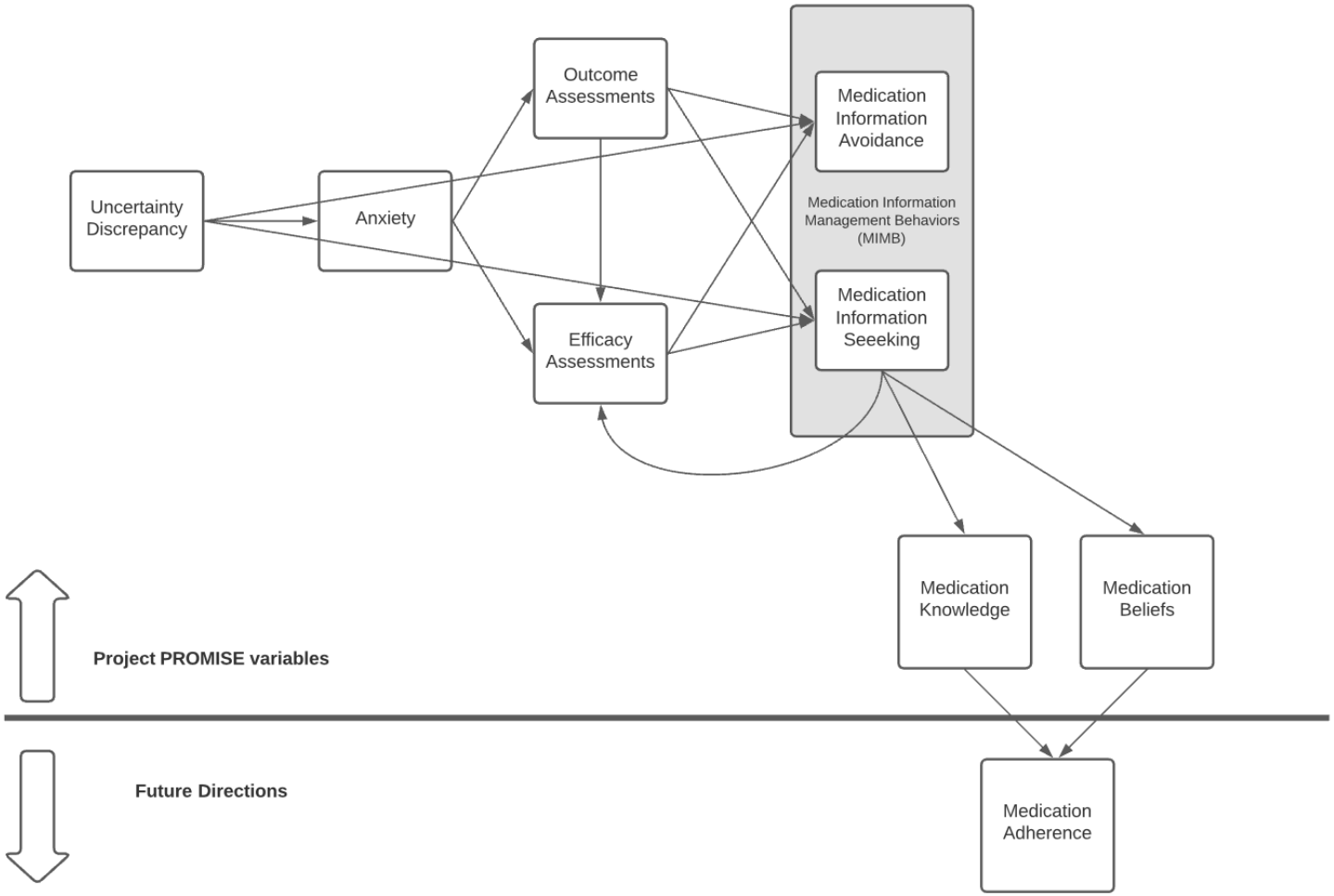

Figure 2.1. Conceptual Framework for Project PROMISE

Table 2.10. Conceptual Definitions

Concept	Conceptual Definition
Uncertainty discrepancy	the difference between how much an individual desires to know and actually knows about a topic
Anxiety	the emotional response related to uncertainty
Outcome assessments	the expected outcomes of information management behaviors
Efficacy assessments	the extent to which individuals perceive themselves as able to successfully seek information
Medication information management behaviors	the use of specific strategies to manage medication information needs including direct information seeking, indirect information seeking, information avoidance, and cognitive reappraisal
Direct medication information seeking	the active initiation or continued interaction with an information provider for the purpose of obtaining information about medications
Indirect medication information seeking	the use of passive strategies, such as observing the information provider to try to obtain information with actively engaging in interaction about medications
Medication information avoidance	the intentional choice to not obtain information about medications even when information is needed or desired by turning down opportunities to receive information or avoiding information providers
Cognitive reappraisal	the reconsideration of the need for medication information by internally altering attitudes about the importance of the information, the desired level of uncertainty, the meaning of the uncertainty
Medication knowledge	the knowledge of the name, purpose, administration instructions, length of therapy, side effects, warnings or precautions, optimal timing, drug interactions, anticipated therapeutic effect, and storage instructions of a medication
Medication beliefs	the beliefs about the necessity of medications and concerns about prescription dependence, toxicity, or disruptive effect
Medication adherence	the degree to which patients take medications as prescribed, or indicated, by healthcare providers
Medication counseling	the interactive, one-on-one, verbal interaction between a healthcare provider and a patient for the purpose of exchanging information relevant to medication regimens

[1]Definitions adapted from Afifi, W. A., & Weiner, J. L. (2004). Toward a theory of motivated information management. Communication theory, 14(2), 167-190.

2.9 Notes

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CHAPTER 3. METHODS

3.1 Research Design

Project PROMISE was a prospective cohort study of elderly subjects on at least one chronic medication. A sample of older adults, aged 65 and older was recruited from a senior health specialty clinic in Indianapolis. Prospective subjects were interviewed after their physician appointments, and interested individuals were screened for eligibility criteria in the study. Eligible subjects were randomized into one of two groups, usual care (UC) or patient prompted medication counseling (PPMC). After consent, individuals in the UC care group received no intervention or education of any kind. The PPMC group were prompted to ask their pharmacist specific questions about their medication when the next fill or refill of their medication was dispensed at the pharmacy. Both the intervention and usual care groups were followed for one month.

Attitudes towards seeking medication information, as measured by a newly adapted questionnaire based on the theory of motivation information management (TMMI) (Afifi & Weiner, 2004) served as a dependent variable for Aim One. Medication information management behaviors (MIMB) served as the outcome variable for attitudes towards seeking medication information (Aim One), and as the independent variable for medication outcomes (Aim Two). At baseline, MIMB were measured as self-reported information seeking and avoidance over the previous six months. MISB over the course of the study were measured as patients' self-reported information seeking behaviors during medication dispensing. This allowed for the assessment of the predictors and outcomes of MIMB (see Figure 3.1). The primary outcome of the study was medication knowledge, as measured by a newly developed open-ended questionnaire. The secondary outcomes were medication beliefs and efficacy assessments. Medication beliefs were measured by the Beliefs about Medication Questionnaire (BMQ) (Horne et al., 1999), and efficacy assessments were measured by a newly adapted questionnaire based on the theory of motivation information management (TMIM) (Afifi & Weiner, 2004).

Subjects completed baseline questionnaires addressing their attitudes towards seeking medication information, medication beliefs, medication knowledge, and demographic information. Phone interviews were conducted at 48 hours and one month after baseline data collection. MIMB

were assessed at 48 hours and one month. Attitudes towards seeking medication information, medication knowledge, and medication beliefs were assessed at baseline and one month interval.

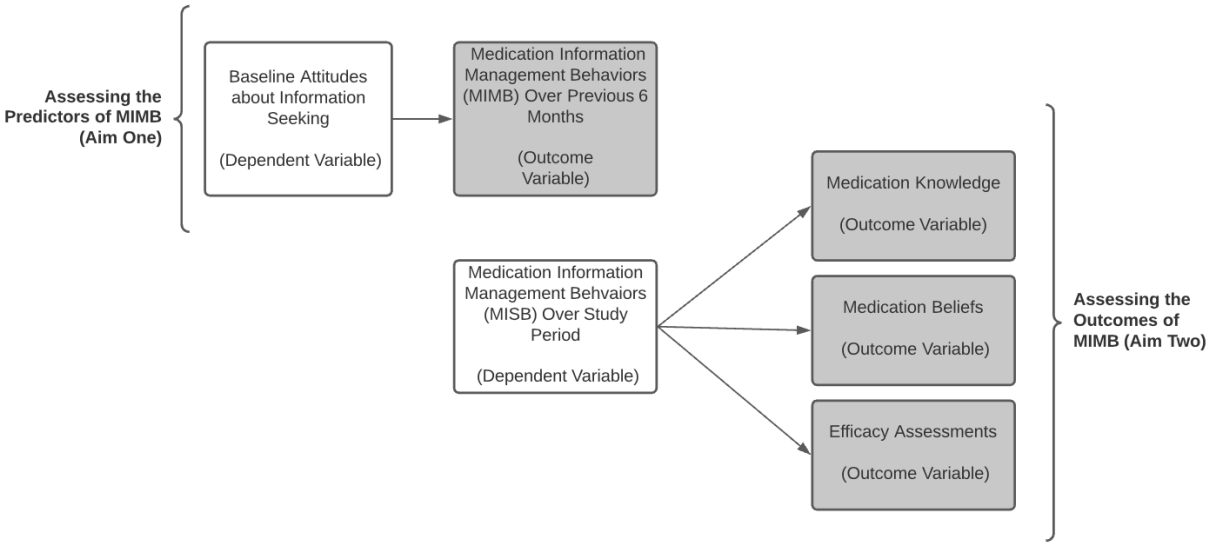

Figure 3.1. Relationships between Dependent and Outcome Variables

3.2 Study Procedures

All subjects completed baseline surveys in the physician office or over the phone. They were also asked to complete two additional follow-up phone interviews and all interviews were conducted by the primary investigator. For in-person baseline data collection, research staff interviewed interested subjects in a private room, as designated by the physician's office. Subjects interested in the study were screened for inclusion and exclusion criteria for the study. Those that met criteria signed consent documents and completed the baseline surveys. Baseline surveys included items regarding: 1) medication information seeking attitudes, 2) demographic characteristics such as gender, age, and ethnicity, 3) medication knowledge, 4) medication beliefs, and 5) subject contact information. All data collection instruments are attached in Appendix A.

All survey instruments were administered verbally to the participants. No paper survey instruments were used, and data was recorded live into the HIPPA compliant program RedCap. If any portion of the baseline surveys could not be completed before the subject needed to leave the physician's office, the research staff offered to complete these surveys over the phone. If baseline

data collection was partially completed in-person, the remaining data was required to be completed within 24 hours of the initial data collection.

Subjects were randomized to either usual care (UC group), or patient prompted medication counseling (PPMC group). After subjects left the physician office, research staff used the electronic medical record (EMR) to verify inclusion and exclusion criteria including age, current medications, and current diagnosis codes. Research staff also verified the prescription information for the most recently prescribed prescription medication. Specific prescription information verified in the EMR included: medication name, dose, frequency, usage instructions, prescribing physician, indication, and refill information. This prescription information was the only information that was extracted from the subject's EMR.

Subjects randomized to the UC group were given no specific instructions about interacting with the pharmacy staff during the study period. Subjects randomized to PPMC group were given specific instructions at the end of baseline data collection to request further information from their pharmacist about their newest medication prescription the next time they visited the pharmacy to pick up their prescription. Subjects were given specific questions on a pocket card to prompt the discussion with the pharmacist. The pocket card included the follow questions (see Appendix B):

1. "What is this medication typically used for?"
2. "How should I take this medication?"
3. "What should I expect from this medication?"

Indiana pharmacy law requires every patient to be offered medication counseling for each prescription at the time of pick-up. All participants in the UC group had the same opportunity to receive medication counseling as those in the PPMC group. The only difference between the groups in the study is that the PPMC group were specifically directed to request medication counseling, educated about the benefits of medication counseling (see Appendix C), and given a list of specific questions to ask the pharmacist during prescription pick-up. Not only did these cards serve as reminders to participants to complete the intervention, they also had the potential to improve communication efficacy, by helping the participants know what to ask the pharmacist.

The patient education was designed as a simple one-page patient handout given to the participants in the intervention group. Practically, this handout was meant to help the subjects

know how to navigate the pharmacy during their next prescription pick-up. Theoretically, it targeted TMIM variables meant to encourage participants in the intervention group to seek information from their pharmacist (see Table 3.1). The intervention group for this study was designed due to concerns based on past literature and clinical experience that a low percentage of patients would voluntarily and actively seek medication information during the study period. The study intervention was designed to increase variability in information seeking in the study sample, and not specifically designed to assess the impact of an educational intervention.

Table 3.1. Theoretical Constructs Targeted by Patient Education

Theoretical Construct	Patient Education Sheet Text
Anxiety	Seniors have a higher chance for problems with their medicines.
Uncertainty Discrepancy	Many older adults do not have all the information about their medicine.
Target Efficacy	Your pharmacist can help you understand your medicine. Pharmacists are the "medication experts" of the healthcare system. They go to school for six or more years learning how to help you use your medicines safely. Pharmacists may look busy, but this does not mean they are not willing to talk to you! If someone asks you if you have questions for the pharmacist, say **YES.** You don't need an appointment to talk to a pharmacist. If you have questions when you get home, you can call your pharmacist anytime.
Communication Efficacy	If you don't know what to ask your pharmacist, that is ok! Just tell them that you want more information about the medicine. There are lots of different types of employees that work in a pharmacy. Make sure you ask to talk to the pharmacist.
Outcome Assessments	If other patients are waiting in line behind you, most pharmacies have special windows or areas for people that want to talk to the pharmacist. It usually only takes a couple of minutes for the pharmacist to give you the facts you need to know about your new medicine.

All eligible participants from both the UC and PPMC groups were contacted over the phone for two follow-up surveys after baseline data collection. The first follow-up was specifically designed to collect addition data about prescription pick-up and occurred within 48 hours of baseline data collection. This allowed baseline medication seeking information to be collected after the first prescription pick-up, even for patients who were newly prescribed medications at their consent appointment. The final follow-up occurred one month after baseline data collection for all subjects. Each subject was compensated for the interviews as follows: $10 for baseline data collection, $5 for the 48-hour follow-up, and $10 for the one-month follow-up for a total of $25 (see Table 3.2).

Table 3.2. Data Collection Summary

Timing of Assessment	Baseline Data Collection	48 hours post-baseline	1 Month post-baseline
Location of Assessment	In-Person or Over the phone	Over the phone	Over the phone
Data Collected	Knowledge About New Chronic Medication		Knowledge About New Chronic Medication
	Beliefs About Medicines		Beliefs About Medicines
	Demographics		Demographics
	Attitudes About Seeking Medication Information		Attitudes About Seeking Medication Information
	Medication Information Seeking Behaviors	Medication Information Seeking Behaviors	Medication Information Seeking Behaviors

3.3 Setting

Elderly adults, aged 65 and older, who were taking at least one chronic medication were recruited from a primary care physician office during the course of regularly scheduled appointments. This allowed for targeted recruitment of an elderly outpatient population, while limiting bias that may have occurred from recruiting patients from a community pharmacy setting, thus influencing pharmacists' awareness of the study.

The recruitment facility was a specialty geriatric clinic in Marion county. This clinic treats outpatients over the age of 65 and focuses on the unique needs of senior adults by providing individualized treatment plans for the medical, emotional, and social needs of their patients. This facility was selected due to its large population of older adults on chronic medications and ability to specifically target lower-education levels and non-white participants. In addition, the clinic provided a unique set-up with multiple physicians holding clinics at the same time. This allowed for the data collection across multiple prescribers while retaining the feasibility of recruiting from a single clinic. Appropriate IRB approval through the clinic's institution was obtained along with Purdue University IRB approval. Consent forms are attached in Appendix D.

Research and clinic staff identified a schedule for recruitment that included both morning and afternoon recruitment times on randomly selected weekdays. During subject recruitment days, research staff sat at a designated desk in the physician office near the area where patients exited the clinic. After the appointment, research staff attempted to recruit subjects during the checkout process. Research staff recruited subjects with the following script: "Your physician office is collaborating with researchers from Purdue University who are interested in your experiences with taking medications. If you are eligible, you may earn up to $25 for participating. The study involves completing 10-15 minutes of in-person surveys today, and up to two follow-up surveys over the phone. Would you like to learn more about participating?" Research staff took interested subjects to a private room, as designated by the physician's office. Interested subjects were screened for inclusion and exclusion criteria for the study.

3.4 Inclusion and Exclusion Criteria

Inclusion criteria were developed to target elderly patients who were prescribed new medications and obtained or planned to receive these prescriptions from community pharmacies. A "new" prescription was defined as any prescription started within the previous three months. If there were multiple new medications prescribed within the last three months, the most recently prescribed medication was selected as the new medication.

Inclusion criteria for the sample included participants that were aged 65 years or older and currently prescribed at least one chronic medication. A chronic medication was defined as any medication the subject had been taking for longer than three months. In addition, participants had to be prescribed a new chronic prescription. A new prescription was defined as one that was

prescribed within three months of baseline data collection, and that the subject has not previously taken. Participants must have obtained at least one medication in a community pharmacy (i.e. Walgreens, CVS, Kroger, etc.) in the last 3 months. Finally, participants were required to be picked up or planned to be picked up the new prescription at an outpatient community pharmacy setting (i.e. Walgreens, CVS, Kroger, etc.) within 48 hours of baseline data collection.

Exclusion criteria for the sample included participants that had a diagnosis of dementia verified by the electronic medical record or were unable to speak or read English. Participants that lived in a nursing home or other non-community-based institution or received home-health care services directly related to medication use were excluded. Participants were also excluded if they had a formal or informal caregiver who were the primary managers of the subject's medications. Any participant that planned to have the new prescription filled by a mail order pharmacy, or any type of pharmacy where participants would not have the opportunity to directly interact with a pharmacist during medication dispensing were excluded. Finally, if participants that had their new prescription prescribed on the day of consent, those participants were excluded if they did not plan to pick up that prescription within 72 hours of baseline data collection.

3.5 Study Sample

Sample size was calculated, based on the primary outcome of this study: medication knowledge. Because the instrument used to measure medication knowledge was newly developed for this study, estimates for sample parameters were identified from other studies on medication knowledge in older adults, which report average baseline knowledge scores of approximately 50% (Avorn, 2017; Simonson & Feinberg, 2005). Statistical comparisons were based upon the independent variable pharmacist counseling (Group 1: did not seek medication information from a pharmacist and Group 2: did seek medication information from a pharmacist). A power analysis was performed to determine the sample size needed to detect a 16% change in medication knowledge scores (from 50 to 60, S.D. = 20), when the correlation in scores between occasions is 0.7. To achieve a power of 0.8 with an alpha of 0.05, a goal of recruiting 62 subjects for each group was established (total N=124). To account for potential dropout participants during this longitudinal study, an attempt was made to recruit 150 subjects.

A retention plan was developed to decrease dropouts. The plan included strategies to collect contact information from participants and remind them of follow-ups calls. Researchers requested

two phone numbers and an email address for each subject at baseline. Contact information for a family member or friend was also requested in case of loss of contact. All patients were asked to sign a paper declaring their intention to participate in all follow-ups during consent, and this paper was sent to the subject with their compensation. Finally, the 48 hour follow-up was scheduled during baseline data collection, and the one month follow-up was scheduled during the 48 hour follow-up.

3.6 Study Instruments

3.6.1 Attitudes About Seeking Medication Information Instrument

An instrument measuring attitudes about medication information seeking was newly developed and based on the TMIM. The instrument was 98-items adapted from previous studies that have used TMIM in other health communication contexts and measured uncertainty discrepancy, anxiety, outcome assessments, efficacy assessments, and MIMB. All items that we specific to the information provider were asked in relation to pharmacists and physicians, and the outcome assessments were based on 10 newly developed scenarios (five positive scenios and 5 negative scenarios) specific to the pharmacy context.

A 98-item survey was piloted with 10 individuals over the phone. Cognitive interviewing was used to review all items for health literacy concerns, and the time to administer the survey was assessed. The original survey took 15-20 minutes to administer and based on these cognitive interviews, the instrument was reduced from 98 items to 50 items. A majority of the physician-centered questions were removed as a result, and the number of scenarios utilized for outcome and efficacy assessments were reduced. Finally, all items addressing alternate emotions were removed after older adults expressed significant difficulty understanding and answering these items. The final questionnaire measured the following constructs: issue importance (1 item), uncertainty discrepancy (2 items), anxiety (2 items), outcome expectancy (10 items), coping efficacy (5 items), target efficacy (8 items), and information management systems (8 items). Reliability of each construct-specific subscale was calculated using Cronbach's alpha. Constructs measured by the instrument were operationalized into sets of 1-10 questions and measured on a 7-point Likert scale (see Table 3.3).

Table 3.3. Attitudes about Seeking Medication Information Constructs

Construct	Definition	Items	Measurement (Anchors)	Specific Aims/ Hypotheses
Issue Importance	the degree of importance of the topic that is focus of information management behaviors	It is important to me that I know about my medications	Strongly Disagree to Strongly Agree (1-7)	Aim One, Hypothesis 1
Uncertainty Discrepancy	the difference between how much an individual desires to know and actually knows about a topic	Overall, how certain are you that you know everything you need to know about your medications? Overall, how certain do you want to be that you know everything you need to know about your medications?	Completely Uncertain to Completely Certain (1-7)	Independent Variable Aim One, Hypotheses 1-3
Anxiety	the emotional response related to uncertainty	It worries me when I compare how much I know about my medications to how much I want to know. It makes me anxious to think about the difference between how much I want to know about my medications and how much I actually know.	Strongly Disagree to Strongly Agree (1-7)	Dependent Variable Aim One, Hypothesis 3 Independent Variable Aim One, Hypothesis 4

Table 3.3. continued

Construct	Definition	Items	Measurement	Specific Aims/ Hypotheses
Outcome Expectancies	the expected positive and negative outcomes of information management behaviors	If I ask the pharmacist about my medications, I will get more benefit from my medication. If I ask the pharmacist about my medications, I will know more about my medicine. If I ask the pharmacist about my medications, my confidence in managing my medication will increase. If I ask my pharmacist about my medications, my chances of having problems with the medicine will decrease. If I ask my pharmacist about my medications, it will be easier to take my medicine correctly. If I ask the pharmacist about my medications, it will remind me that I am sick or unwell. If I ask the pharmacist about my medications, other patients that are waiting will get upset. If I ask the pharmacist about my medications, I will look uneducated. If I ask the pharmacist about my medications, the information I get will be overwhelming. If I ask the pharmacist about my medications, I will have to spend a more time in the pharmacy.	Extremely Likely to Extremely Unlikely (1-7)	Dependent Variable Aim One, Hypothesis 4 Independent Variable, Aim One, Hypothesis 5-6 Independent Variable, Aim One, Hypothesis 7

Table 3.3. continued

Construct	Definition	Items	Measurement	Specific Aims/ Hypotheses
Coping Efficacy	extent to which information seeker has the resources to use information given and deal with the negative outcomes of the information seeking process	If you are reminded that you are sick or unwell, how able to cope with this situation are you? If other patients that are waiting get upset, how able to cope with this situation are you? If you look uneducated, how able to cope with this situation are you? If the information you get from a pharmacist is overwhelming, how able to cope with this situation are you? If you have to spend a longer amount of time in the pharmacy or physician's office, how able to cope with this situation are you?	Extremely Unable to Extremely Able (1-7)	Dependent Variable Aim One, Hypothesis 4 Independent Variable, Aim One, Hypothesis 5-6 Mediator, Aim One, Hypothesis 8
Target Efficacy (Honesty)	the extent the target is willing to communicate information to the information seeker	A pharmacist would be completely honest about my medications. A pharmacist is available to talk to me about my medications. A pharmacist typically wants to talk to me about my medications. A pharmacist has the time to talk to me about my medications. A doctor would be completely honest about my medications. A doctor is available to talk to me about my medications. A doctor typically wants to talk to me about my medications. A doctor has the time to talk to me about my medications.	Strongly Disagree to Strongly Agree (1-7)	Dependent Variable Aim One, Hypothesis 4 Independent Variable, Aim One, Hypothesis 5-6 Dependent Variable, Aim One, Hypothesis 7 Mediator, Aim One, Hypothesis 8 Dependent Variable, Aim 2, Hypothesis 4

Table 3.3. continued

Construct	Definition	Items	Measurement	Specific Aims/ Hypotheses
Target Efficacy (Ability)	Extent the target is able to communicate the information to the information seeker	A pharmacist can provide me with the information I want about my medications. A pharmacist has complete information about medications. A doctor can provide me with the information I want about my medications. A doctor has complete information about medications.	Strongly Disagree to Strongly Agree (1-7)	Dependent Variable Aim One, Hypothesis 4 Independent Variable, Aim One, Hypothesis 5-6 Dependent Variable, Aim One, Hypothesis 7 Mediator, Aim One, Hypothesis 8 Dependent Variable, Aim 2, Hypothesis 4

Table 3.3. continued

Construct	Definition	Items	Measurement	Specific Aims/ Hypotheses
Communication Efficacy	the extent to which the information seeker feels able to communicate with the target	I know what to say to get information about my medications from a pharmacist. I know what questions to ask a pharmacist about my medications. I am confident I can approach a pharmacist to talk about my medications	Strongly Disagree to Strongly Agree (1-7)	Dependent Variable Aim One, Hypothesis 4 Independent Variable, Aim One, Hypothesis 5-6 Dependent Variable, Aim One, Hypothesis 7 Mediator, Aim One, Hypothesis 8 Dependent Variable, Aim 2, Hypothesis 4

Table 3.3. continued

Construct	Definition	Items[1]	Measurement	Specific Aims/ Hypotheses
Information Management Behaviors	the use of specific strategies to manage information needs including direct information seeking, indirect information seeking, information avoidance, and cognitive reappraisal	1. Asked a pharmacist questions about my medications 2. Avoided asking a pharmacist questions about my medications, even though I wanted or needed to ask a question 3. Talked to a pharmacist in hopes that they would answer my questions about my medications without me asking 4. Asked a friend or family member questions about my medications 5. Searched the internet for answers to questions about my medications 6. Asked a doctor questions about my medications 7. Avoided asking a doctor questions about my medications, even though I wanted or needed to ask a question 8. Talked to a doctor in hopes that they would answer my questions about my medications without me asking	Never to Every Time (1-7)	Dependent Variable, Aim One, Hypothesis 1 Dependent Variable, Aim One, Hypotheses 5-6 Dependent Variable, Aim One, Hypothesis 8 Independent Variable, Aim Two, Hypotheses 1-4

[1]Over the last six months how often have you…

Major adaptations of this instrument from previous research included the use of multiple information providers and standardizing cases across outcome expectancies and coping efficacy. For items addressing target efficacy, this study includes one set of items addressing pharmacists as information providers, and another set of items addressing physicians as information providers. This is the first time a study has included items addressing two information providers simultaneously and will allow for measurement not only of efficacy and outcome assessments, but also relative scores in future work.

Cases were also standardized across outcome expectancies and coping efficacy. Outcome expectancies are typically measured by creating a series of potential scenarios as individual items, while coping efficacy (i.e. the extent to which information seekers have the resources to use the information provided and deal with the negative outcomes of the information seeking process) is measured with a separate unrelated set of items. Coping efficacy has not performed consistently in past studies. Most studies have measured coping efficacy as the extent to which participants have the resources to use the information provided and have not addressed participants' ability to cope with negative outcomes of information seeking (Afifi, 2016). For Project PROMISE, a new instrument containing five positive and five negative scenarios specific to seeking information from a pharmacist were developed to measure outcome expectancies. The five negative scenarios from the outcome assessment measure were carried forward and utilized in the measurement of coping efficacy in hopes of increasing precision of measurement

3.6.2 Knowledge About New Chronic Medication Instrument

There is no "gold-standard" approach to measure medication knowledge in previous literature. Measurement and scoring of medication knowledge is complicated by the role of clinical judgement. Healthcare providers may have differing opinions as to what types of knowledge are clinically important, and what is considered "correct" and "incorrect" knowledge. Most of the past work relies on self-developed single-use instruments, without an explanation as to how or why particular knowledge domains were included or excluded from the measure.

Without consensus in the previous literature, the primary investigators searched for consensus among clinical experts. Two groups of clinical organizations (e.g. American Medical Association, the American Association of Colleges of Nursing, the American Association of Colleges of Pharmacy, etc.) have created lists of questions regarding medication knowledge to be

used in clinical settings. These lists are meant to represent the medication knowledge that these groups feel is necessary for patients to understand about their medications. After review of two different lists of medication knowledge items, medication knowledge was measured in this study using an open-ended survey instrument based on 10 questions developed for a national campaign sponsored by National Council on Patient Information and Education (see Table 3.4):

1. What is the name of your new medicine?
2. Why are you taking your new medicine or what is it used for?
3. How and when should you take your new medicine, and for how long?
4. What side effects should you expect from your new medicine, and what should you do about them?
5. Should you take your new medicine on an empty stomach or with food?
6. Should you avoid any activities, foods, drinks, alcohol, or other medicines while taking your new medicine?
7. What is the best time of day to take your new medication?
8. Will your new medicine work safely with any other medicines you are taking, including over-the-counter medicines?
9. When should you expect your new medicine to begin to work, and how will you know if it's working?
10. How should you store your new medicine?

Open ended questions were read aloud to participants, and answers were directly transcribed by the primary investigator into the RedCap system. At the end of data collection, a rubric developed by the investigators was provided to two pharmacists to score ten example knowledge questionnaires. The pharmacist scorers were employed in the community pharmacy setting. After scoring, the pharmacists met with the primary investigator to discuss discrepancies in scoring; and the rubric was adapted based on this feedback to include specific examples for each rubric category. This process was repeated a total of three times until the scoring for the pharmacists reached greater than 80% agreement on the knowledge instruments.

The resulting rubric was then shared with five additional community pharmacists for qualitative feedback. The feedback and changes to the rubric based on the feedback are summarized in Appendix E. The final rubric is included in Appendix F. The pharmacists met with

Table 3.4. Medication Knowledge Constructs

Construct		Items	Measurement (Potential Score)	Specific Aims/ Hypotheses
Medication Knowledge	Indication	Why are you taking your new medicine or what is it used for?	Each item administered as open-ended survey question and scored as Incorrect Answer, No Answer, Incomplete Answer, or Correct Answer (-1 to 2)	Dependent Variable, Aim Two, Hypothesis 1-2
	Effectiveness-How	When should you expect your new medicine to begin to work, and how will you know if it is working?		
	Effectiveness-Timing			
	Name	What is the name of your new medicine?		
	Duration of treatment	How and when should you take your new medicine, and for how long?		
	Usage Instructions			
	Timing of dose	What is the best time of day to take your new medication?		
	Timing- Meals	Should you take your new medicine on an empty stomach or with food?		
	Side Effects	What side effects should you expect from your new medicine, and what should you do about them?		
	Side Effects-Response			
	Contraindications/ Precautions/ Warnings	Should you avoid any activities, foods, drinks, alcohol, or other medicines while taking your new medicine?		
	Interactions	Will your new medicine work safely with any other medicines you are taking, including over-the-counter medicines?		
	Storage	How should you store your new medicine?		

[1]Adapted from National Council on Patient Information and Education (NCPIE) national education campaign, Talk Before You Take.

the primary investigator to review the final rubric, and then scored all knowledge assessments in random order.

Unidentified patient responses to the Knowledge about New Chronic Medication instrument were provided to the scorers, along with the prescription information and the patient education handout from Lexicomp drug information. Lexicomp was chosen as the source for medication information, after comparison between the medication provided in Micromedex and Lexicomp for the top 20 prescribed medications in the United States (see Appendix G).

The final rubric was utilized to score all participants, and the original score from each practicing pharmacist was retained. Each participant's answers were scored as Incorrect, No Answer, Incomplete, or Correct. Scores for each item ranged from -1 to 2. Reliability of the final rubric was assessed by evaluating the inter-rather reliability of the original scores from each pharmacist (Cronbach 1951, Guttman 1945) A mean score for all items were calculated to produce a final score for medication knowledge.

Information recall is the ability of individuals to remember medical information given to them and is a commonly used variable in patient-centered studies of physician communication (Gupta & Agarwal, 2013). Information recall has been associated with medication adherence and patient satisfaction with providers (Gupta & Agarwal, 2013). In this study, information recall will be calculated by comparing the baseline medication knowledge assessment score with the medication knowledge assessment scores at the one month follow-up. Information recall will be calculated as a percentage of medication knowledge retained, or a ratio of the month one knowledge score over the baseline score.

3.6.3 Beliefs About Medicines Instrument

Beliefs about medications were measured using a previously validated instrument, the Beliefs about Medicines Questionnaire (BMQ) (Horne et al., 1999). No changes or adaptations were made to this instrument, and permission for the use of this instrument is included in Appendix H. The instrument included 15 items measuring necessity beliefs (four items), concern beliefs (three items), harm beliefs (four items), and overuse beliefs (four items). A summary of the constructs covered in this instrument are shown below in Table 3.5.

3.6.4 Medication Information Seeking Behaviors Instrument

This instrument was used to assess new information subjects received or sought about their new medication. The instrument also accounted for the specific sources of the information. Items were asked as open-ended questions. Participants were also asked a series of open-ended questions relating to their interactions with pharmacy staff during the last prescription pick up. Along with measuring medication information management behaviors (MIMB), these questions served as a measure of intervention fidelity. A summary of the constructs covered in this instrument are shown below in Table 3.6.

3.6.5 Demographic Characteristics Instrument

Pertinent demographic data, including age, gender, ethnicity, educational level, and socioeconomic status, were obtained. This demographic instrument was previously utilized by other pharmacy communication researchers and will ensure comparability of study results. The demographic instrument also included a one question measure of health literacy, and a measure of medication adherence. A summary of the constructs covered in this instrument are shown below in Table 3.7.

Although more complete measures, such as the Rapid Estimate of Adult Literacy in Medicine (REALM) and Test of Functional Health Literacy in Adults (TOFHLA), are valid and reliable methods of assessing health literacy (Davis, 1993; Parker, 1995), the length of the overall instrument was a concern. Therefore, single item measures of health literacy were considered. Participants were asked “How confident are you filling out medical forms by yourself?” This item has been tested in outpatient clinic settings and found to be accurate in determining limited and marginal health literacy (Wallace, 2006). “Somewhat confident” was utilized as the cut-off point for sufficient health literacy (Wallace, 2006).

Table 3.5. Beliefs about Medicines Construct Table

Construct	Items[1]	Measurement	Specific Aims/ Hypotheses
Necessity Beliefs- Specific	1. Without my medicines, I would be very ill. 2. My life would be impossible without my medicines. 3. My health in the future will depend on my medicines. 4. My medicines protect me from becoming worse.	Strongly Disagree to Strongly Agree (1-5)	Dependent Variable, Aim Two, Hypothesis 3
Concern Beliefs- Specific	1. I sometimes worry about becoming too dependent on my medicines. 2. My medicines disrupt my life 3. These medicines give me unpleasant side effects.	Strongly Disagree to Strongly Agree (1-5)	
Harm Beliefs- General	1. Medicines do more harm than good. 2. All medicines are poisons. 3. Most medicines are addictive. 4. People who take medicines should stop their treatment for a while every now and again.	Strongly Disagree to Strongly Agree (1-5)	
Overuse Beliefs- General	1. Natural remedies are safer than medicines. 2. Doctors use too many medicines. 3. If doctors had more time with patients, they would prescribe fewer medicines. 4. Doctors place too much trust on medicines.	Strongly Disagree to Strongly Agree (1-5)	

[1]Items used with permission from Horne, R., Weinman, J., & Hankins, M. (1999). The beliefs about medicines questionnaire: the development and evaluation of a new method for assessing the cognitive representation of medication. Psychology and health, 14(1), 1-24.

Table 3.6. Medication Information Seeking Behaviors Construct Table

Construct	Items	Measurement	Specific Aims/ Hypotheses
Information Exchange During Prescribing	Did you seek out or receive any new information about your new medication? If yes, list the source of the information.[1] What specific information about your new medication did you receive from these sources?	Open-ended questions	Independent Variable, Aim Two, Hypotheses 1-4
Information Exchange During Dispensing	Did anyone ask you if you had any questions about your medication when you picked it up? What was your response? Did you talk to any pharmacy staff about your new medication when you picked it up? If no, did you attempt to talk to any pharmacy staff about your medication? Did any pharmacy staff attempt to speak to you? If yes, do you know if the person you spoke with was a pharmacist or other member of the team? If you spoke with a pharmacist, how long did you spend talking to a pharmacist? If you spoke with a pharmacist, who started the conversation? Did you ask to speak with the pharmacist or did the pharmacist approach you to speak to you without you asking? If you spoke with a pharmacist, what do you remember about what information was specifically given to you about the medication?	Open-ended questions	Independent Variable, Aim Two, Hypotheses 1-4
Information Exchange During Administration/ Monitoring	Have you sought out or received any new information about your new medication since the last survey? If yes, list the source of the information.[1] What specific information about your new medication did you receive from these sources?	Open-ended questions	Independent Variable, Aim Two, Hypotheses 1-4

[1]…was this information from a personal source (such as a family member or friend), from a medical professional, or from another source such as paper literature or the Internet?

Table 3.7. Demographic Construct Table

Construct	Items	Measurement	Specific Aims/ Hypotheses
Sex	I am:	Dichotomous	Potential covariates,
Age	My age is:	Scale	Aim One and Two
Ethnicity	Are you of Hispanic, Latino, or Spanish origin?	Dichotomous	
Ethnicity	Which of the following categories best described your ethnicity?	Nominal	
Education Level	What is the highest level of school you have completed or the highest degree you have received?	Nominal	
Health Literacy	How confident are you filling out medical forms by yourself?	Extremely to Not at All (1-5)	
Medication Adherence[1]	How often do you forget to take your medicine?	None of the Time to All of Time (1-4)	
	How often do you decide not to take your medicine?		
	How often do you forget to get your prescriptions filled?		
	How often do you run out of medicine?		
	How often do you skip a dose of your medicine before you go to the doctor?		
	How often do you miss taking your medicine when you feel better?		
	How often do you miss taking your medicine when you feel sick?		
	How often do you miss taking your medicine when you are careless?		
	How often do you change the dose of your medicines to suit your needs (like when you take more or less of a pill than you are supposed to)?		
	How often do you forget to take your medicine when you are supposed to take it more than once a day?		
	How often do you put off refilling your medicines because they cost too much money?		
	How often do you plan ahead and refill your medicines before they run out?		

[1]Items used with permission from [1]Items used with permission from Kripalani, S., Risser, J., Gatti, M.E., & Jacobson, T.A (2009). Development and evaluation of the Adherence to Refills and Medicines Scale (ARMS) among low-literacy patients with chronic disease. Value in Health, 12(1), 118-123.

Self-reported medication adherence was also measured in conjunction with demographics as an additional potential study covariate. Although the Morisky scale (Morisky, 2008) is considered the gold-standard for self-reported adherence measures (Krousel-Wood, 2009a) and has been utilized in older adult populations (Krousal-Wood, 2009b), the instrument was cost prohibitive due to resource constraints of the study. Alternate self-report tools from a systematic review were considered (Nguyen, 2013), and the ARMS scale was selected this study (Kripalani, 2009). The ARMS scale was validated in low literacy populations with chronic disease and has high internal consistency (Cronbach's alpha=0.814) (Kripalani, 2009). It correlates significantly with the Morisky adherence scale (Spearman's rho = 0.651, $P < 0.01$), and outperformed the Morisky scale in correlations with refill adherence (Kripalani, 2009). The range of possible scores is 12 to 48 with lower scores indicating better adherence.

3.7 Variables and Data Analysis

Descriptive statistics were calculated for all individual items. Cronbach's alphas were calculated for all sub-scales to determine internal reliability. Normality was assessed for all variables by assessing the critical ratio for skewness, the critical ratio for kurtosis, the Kolmogorov-Smitnov test statistic and the Shapiro-Wilk test statistic. All tests utilized in the analyses were considered statistically significant at $p< 0.05$.

3.7.1 Aim One

The purpose of aim one was to describe older adults' attitudes about medication information seeking and the relationships between these attitudes and medication information seeking behaviors. Aim one was tested by assessing the participants' uncertainty discrepancy, anxiety, outcome assessments, and efficacy assessments at baseline. Self-reported MIMB over the six months prior to beginning the study were also measured at baseline.

Attitudes about information seeking functioned as the independent variables, and MIMB were the dependent variable (see Table 3.8). Spearman's correlations were used for bivariate comparisons. Structural equation modeling was used to determine statistically significant relationships between each of the variables in the TMIM at baseline. Measurement models were tested for outcome assessments and efficacy assessments as individual latent variables and as

single-higher order factors. Variables from the final measurement models were tested in a structural model based on the *a prior* hypotheses.

3.7.2 Aim Two

Aim two was tested by assessing the participants' medication knowledge, medication beliefs, and efficacy assessments at baseline and month one. Self-reported MIMB were also assessed during each contact with the participant. Participants were asked about their information seeking during initial medication prescribing, initial medication dispensing, refill medication dispensing, and any additional information seeking outside of medication encounters during the study period.

Bivariate correlations were used to determine statistically significant relationships between variables. Hierarchical regression was performed to further characterize statistically significant relationships between the independent variable (no counseling versus counseling received) and dependent variables of medication outcomes. To control for the influence of baseline outcome measures (medication knowledge, medication beliefs, and efficacy assessments), scores at baseline were added to the regression in the first step of the regression, prior to the independent variable or any other covariates. The effect of the intervention was also added to the regression as a dichotomous variable (UC vs. PPMC groups). Covariates were added to the model for demographic characteristics with statistically significant associations with` the outcome variable.

Table 3.8. Variable Details and Analysis

Variable	Type	Instrument	Aim 1 Analysis	Aim 2 Analysis
Uncertainty Discrepancy	Independent Variable	Attitudes About Seeking Medication Information Instrument	Structural Equation Modeling Spearman's Correlation	
Anxiety	Independent Variable	Attitudes About Seeking Medication Information Instrument	Structural Equation Modeling Spearman's Correlation	
Outcome Assessments	Independent Variable	Attitudes About Seeking Medication Information Instrument	Structural Equation Modeling Spearman's Correlation	
Efficacy Assessments	Aim 1: Independent Variable Aim 2: Dependent Variable	Attitudes About Seeking Medication Information Instrument	Structural Equation Modeling Spearman's Correlation	Hierarchical Regression
Medication Information Seeking Behaviors	Aim 1: Dependent Variable Aim 2: Independent Variable	Attitudes About Seeking Medication Information Instrument Medication Information Seeking Behaviors Instrument	Structural Equation Modeling Spearman's Correlation	Hierarchical Regression
Medication Knowledge	Dependent Variable	Knowledge About New Chronic Medication Instrument		Hierarchical Regression
Information recall	Dependent Variable	Knowledge About New Chronic Medication Instrument		Hierarchical Regression
Medication Beliefs	Dependent Variable	Beliefs About Medicines Questionnaire		Hierarchical Regression

3.8 Notes

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CHAPTER 4. RESULTS

The results of Project PROMISE are presented below. Demographic information obtained at baseline is described in the first section. The descriptive results for the independent and dependent variables are presented in the second section, and sections three and four detail the analyses for Aims 1 and 2.

The surveys at baseline and at 48-hours were completed by 132 participants. Month one assessments were completed by 126 participants (95.4% retention rate). A summary of participants who were approached for the study, but failed screening criteria is presented in Table 4.1. The six participants who did not complete the month one assessments were lost to follow-up.

Table 4.1. Summary of Excluded Participants

Reason for Exclusion	N
Participant declined	19
Non-English speaking	8
Dementia	55
Participant relies on assistance from home health or caregiver for medication management	144
Mail order pharmacy	22
No new prescription medication in previous 3 months	280

4.1 Demographic Profile

Demographic information for the 132 baseline participants is presented in Table 4.2. The range of ages in the sample was 65-95 with a mean age of 74.89 (SD: 6.73). Participants were prescribed a range of 2-31 medications, and the mean number of prescribed medications in the sample was 14.42 (SD: 6.29). A majority of the participants were female (82.6%) and Black/African American (53.8%). Other ethnicities represented in the sample include: White/Caucasian (41.7%), American Indian or Alaska Native (1.5%), and Hispanic, Latino, or Spanish origin (3%).

Participants were asked to report their highest level of educational attainment. Over half of the sample had no secondary education with 35.6% reporting receipt of a high school degree or equivalent and 25% reporting less than a high school degree. Twenty-two percent of the sample

had some type of a college degree, with 9.9% reporting receiving an associate degree, 8.3% a bachelor's degree, and 3.8% a graduate degree.

The health literacy level was estimated by asking participants to self-report their confidence in filling out medical forms by themselves (Wallace, 2006). Half of the sample reported being quite a bit (30.3%) or extremely (19.7%) confident. Just over a quarter of the population reported being somewhat confident (25.8%), with the remaining participants reporting being a little bit (13.6%) or not at all (10.6%) confident. Based on a cut-off point of "somewhat confident," 50% of the sample had limited or marginal health literacy (Wallace, 2006).

Self-reported medication adherence was also measured in conjunction with demographics as an additional potential study covariate. Frequencies for adherence items are presented in Tables 4.3 and 4.4. At baseline, 55% of participants reported forgetting their medicine some of the time, and another 40% of participants reported forgetting their medicine none of the time. Less than 5% of participants reported forgetting their medicine most or all of the time. At month one, results were similar with 95.2% of patients reporting forgetting their medicine some (54.4%) or none (40.8%) of the time. Over 75% of participants reported never deviating from their prescribed medicines by skipping a dose before going to the doctor (77.7%) and missing the medicine when feeling better (83.1%) or sick (76.9%).

The only two categories in which more than 10% of participants reported deviating most or all of the time were forgetting to take the medicine when it was prescribed more than once a day (12.5%) and putting off refilling the medicines because they cost too much money (11.6%). At month one, the only category in which more than 10% of participants reported deviating most or all of the time was putting off refilling medicines because they cost too much money (12%).

Table 4.2. Frequencies of Selected Demographic Variables (N=132)

Demographic Variable	n	%
Gender		
Female	109	82.6
Male	23	17.4
Are you of Hispanic, Latino, or Spanish Origin?		
No	128	97.0
Yes	4	3.0
Ethnicity		
Black or African American	71	53.8
White/ Caucasian	55	41.7
Other	4	3.0
American Indian or Alaska Native	2	1.5
Educational Attainment		
Less than high school degree	33	25.0
High school degree or equivalent	47	35.6
Some college but no degree	23	17.4
Associate degree	13	9.9
Bachelor's degree	11	8.3
Graduate degree	5	3.8
How confident are you filling out medical forms by yourself?		
Not at all	14	10.6
A little bit	18	13.6
Somewhat	34	25.8
Quite a bit	40	30.3
Extremely	26	19.7

Table 4.3. Participants' Medication Adherence at Baseline (N=130)

	All of the time n (%)	Most of the time n (%)	Some of the time n (%)	None of the time n (%)
How often do you forget to take your medicine?	1 (0.8)	5 (3.8)	72 (55.4)	52 (40.0)
How often do you decide not to take your medicine?	1 (0.8)	1 (0.8)	43 (33.0)	85 (65.4)
How often do you forget to get your prescriptions filled?	0 (0.0)	3 (2.3)	38 (29.2)	89 (68.5)
How often do you run out of medicine?	0 (0.0)	6 (4.6)	56 (43.1)	68 (52.3)
How often do you skip a dose of your medicine before you go to the doctor?	1 (0.8)	5 (3.8)	23 (17.7)	101 (77.7)
How often do you miss taking your medicine when you feel better?	0 (0.0)	3 (2.3)	19 (14.6)	108 (83.1)
How often do you miss taking your medicine when you feel sick?	2 (1.5)	4 (3.1)	24 (18.5)	100 (76.9)
How often do you miss taking your medicine when you are careless?	2 (1.5)	5 (3.8)	49 (37.7)	74 (56.9)
How often do you change the dose of your medicines to suit your needs (like when you take more or less of a pill then you're supposed to)?	3 (2.3)	8 (6.2)	25 (19.2)	94 (72.3)
How often do you forget to take your medicine when you are supposed to take it more than once a day?***	1 (0.8)	15 (11.7)	46 (35.9)	66 (51.6)
How often do you put off refilling your medicines because they cost too much money?	1 (0.8)	14 (10.8)	33 (25.4)	82 (63.0)
How often do you plan ahead and refill your medicines before they run out?**	34 (26.4)	57 (44.1)	26 (20.2)	12 (9.3)

**n=129

***n=128

Table 4.4. Participants' Medication Adherence at Month One (N=125)

	All of the time n (%)	Most of the time n (%)	Some of the time n (%)	None of the time n (%)
How often do you forget to take your medicine?	1 (0.8)	5 (4.0)	68 (54.4)	51 (40.8)
How often do you decide not to take your medicine?	1 (0.8)	0 (0.0)	42 (33.6)	82 (65.6)
How often do you forget to get your prescriptions filled?	0 (0.0)	3 (2.4)	40 (32.0)	82 (65.6)
How often do you run out of medicine?	0 (0.0)	3 (2.4)	47 (37.6)	75 (60.0)
How often do you skip a dose of your medicine before you go to the doctor?	2 (1.6)	5 (4.0)	15 (12.0)	103 (82.4)
How often do you miss taking your medicine when you feel better?	0 (0.0)	3 (2.4)	14 (11.2)	108 (86.4)
How often do you miss taking your medicine when you feel sick?	1 (0.8)	4 (3.2)	26 (20.8)	94 (75.2)
How often do you miss taking your medicine when you are careless?	0 (0.0)	6 (4.8)	50 (40.0)	69 (55.2)
How often do you change the dose of your medicines to suit your needs (like when you take more or less of a pill then you're supposed to)?	2 (1.6)	4 (3.2)	27 (21.6)	92 (73.6)
How often do you forget to take your medicine when you are supposed to take it more than once a day?**	1 (0.8)	10 (8.1)	37 (29.8)	76 (61.3)
How often do you put off refilling your medicines because they cost too much money?	0 (0.0)	15 (12.0)	32 (25.6)	78 (62.4)
How often do you plan ahead and refill your medicines before they run out?**	39 (31.5)	44 (35.5)	22 (17.7)	19 (15.3)

**n=124

Means and standard deviations for baseline and month one adherence scores are provided in Table 4.5. Item 12 was reverse coded at each time point prior to reporting the mean. The mean composite score for each study time point was calculated as a summation of all scale items. The range of possible scores for the composite score is 12 to 48 with lower scores representing better adherence. At baseline the range of scores was 12-30 with a mean score of 17.48 (SD: 3.98). At month one the range of scores was 12-27 with a mean score of 17.77 (SD: 3.77). Less than 10% of people scored 12 on the assessment at baseline (7.8%), and 12.1% scored 12 on the assessment at month one.

4.2 Descriptive Results for Independent and Dependent Variables

This section summarizes the reliability and normality data for all constructs in the study. Following this discussion. Frequencies of individual items scores and measures of central tendency are presented for all independent and dependent variables in the study including attitudes about information seeking, medication information seeking behaviors, and medication outcomes.

4.2.1 Reliability and Normality Results

Results related to reliability of sub-scales (Cronbach's alpha) are presented in Table 4.6. Cronbach's alphas >0.7 have been proposed as the appropriate cut-off for subscale reliability (Hundleby & Nunnally, 1968) but results below 0.7 are sometimes considered acceptable in exploratory settings (Hair et al., 1998). Any subscale with a Cronbach's alphas <0.7 was further analyzed to assess individual item-subscale correlations and Cronbach's alpha for subscales when each item was removed from the scale (See Tables 4.7-4.9). Items were retained if the item-

Table 4.5. Changes in Participants' Medication Adherence Between Baseline and Month One

	n	Baseline Mean (SD)	n	Month One Mean (SD)
How often do you forget to take your medicine?*	130	1.65 (0.59)	125	1.65 (0.60)
How often do you decide not to take your medicine?	130	1.37 (0.55)	125	1.36 (0.53)
How often do you forget to get your prescriptions filled?	130	1.34 (0.52)	125	1.37 (0.53)
How often do you run out of medicine?*	130	1.52 (0.59)	125	1.42 (0.54)
How often do you skip a dose of your medicine before you go to the doctor?	130	1.28 (0.57)	125	1.25 (0.60)
How often do you miss taking your medicine when you feel better?	130	1.19 (0.45)	125	1.16 (0.43)
How often do you miss taking your medicine when you feel sick?	130	1.29 (0.60)	125	1.30 (0.57)
How often do you miss taking your medicine when you are careless?	130	1.50 (0.65)	125	1.50 (0.59)
How often do you change the dose of your medicines to suit your needs (like when you take more or less of a pill then you're supposed to)?	130	1.38 (0.71)	125	1.33 (0.62)
How often do you forget to take your medicine when you are supposed to take it more than once a day?*	128	1.62 (0.72)	124	1.48 (0.68)
How often do you put off refilling your medicines because they cost too much money?	130	1.49 (0.72)	125	1.50 (0.70)
How often do you plan ahead and refill your medicines before they run out?	129	2.12 (0.91)	124	2.17 (1.04)
Total Composite Score**	128	17.77 (3.77)	124	17.48 (3.98)

*Statistically significant change based on Wilcoxon-signed rank test ($p<0.05$)

* Statistically significant change based on Wilcoxon-signed rank test ($p<0.01$)

Table 4.6. Reliability Results for Instrument Sub-Scales

Construct	Baseline		Month One	
	n	Cronbach's alpha	n	Cronbach's alpha
Anxiety	130	0.826	125	0.810
Positive Outcome Expectancies	130	0.799	124	0.863
Negative Outcome Expectancies	129	0.616	124	0.714
Communication Efficacy	130	0.894	125	0.888
Coping Efficacy	129	0.705	123	0.725
Target Efficacy-Pharmacists	130	0.881	125	0.891
Target Efficacy-Physicians	129	0.866	125	0.894
Medication Beliefs-Necessity	132	0.859	126	0.856
Medication Beliefs-Concern	132	0.685	126	0.652
Medication Beliefs- Harm	132	0.783	125	0.770
Medication Beliefs-Overuse	132	0.839	126	0.869

Table 4.7. Cronbach's Coefficient Alphas, Item-Subscale Correlations, and Coefficient Alphas if Each Item is Deleted from Negative Outcome Expectancies Subscale at Baseline

Item	Overall alpha	Item-subscale correlations	Alpha if item deleted
Negative Outcome Expectancies Subscale- Baseline	0.616		
If I ask the pharmacist about my medications, it will remind me that I am sick or unwell.		0.328	0.584
If I ask the pharmacist about my medications, other patients that are waiting will get upset.		0.435	0.528
If I ask the pharmacist about my medications, I will look uneducated.		0.390	0.552
If I ask the pharmacist about my medications, the information I get will be overwhelming.		0.458	0.523
If I ask the pharmacist about my medications, I will have to spend more time in the pharmacy.		0.264	0.620

Table 4.8. Cronbach's Coefficient Alphas, Item-Subscale Correlations, and Coefficient Alphas if Each Item is Deleted from Beliefs About Medicines Concern Subscale at Baseline

Item	Overall alpha	Item-subscale correlations	Alpha if item deleted
Beliefs About Medicines- Concern Subscale- Baseline	0.685		
I sometimes worry about becoming too dependent on my medicines.		0.461	0.660
My medicines disrupt my life.		0.543	0.534
These medicines give me unpleasant side effects.		0.514	0.586

Table 4.9. Cronbach's Coefficient Alphas, Item-Subscale Correlations, and Coefficient Alphas if Each Item is Deleted from Beliefs About Medicines Subscale at Month One

Item	Overall alpha	Item-subscale correlations	Alpha if item deleted
Beliefs About Medicines- Concern Subscale	0.652		
I sometimes worry about becoming too dependent on my medicines.		0.417	0.625
My medicines disrupt my life.		0.516	0.478
These medicines give me unpleasant side effects.		0.468	0.558

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subscale correlation was greater than or equal to 0.3, and removal of the item did not improve the sub-scale score (Field, 2009).

Results related to normality (skewness, kurtosis, Kologorov-Smirnov, and Shapiro-Wilk statistics) are presented in Table 4.10. Normality tests were assessed in conjunction with the critical ratios of skewness and kurtosis below. Because normality tests are often overly sensitive to divergence from normality, the critical values for skewness and kurtosis will be utilized to assess potential deviations from normal distribution. Because the sample has more than 50 participants, but less then 300, critical ratios < -3.29 or > 3.29 for skewness or kurtosis represent a statistically significant probability ($p<0.05$) of non-normal distributions (Kim 2013).

Uncertainty Discrepancy

Reliability analysis was not conducted for uncertainty discrepancy, because the construct is measured as the subtraction of two single variables. The data differed from normal at baseline (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) and month one (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was 1.00 at baseline and -0.654 at month one. The critical ratio for kurtosis was 2.28 at baseline and -0.902 at month one. As a result, uncertainty discrepancy was considered normal at baseline and month one in all remaining analyses.

Anxiety

Anxiety was measured with two items and demonstrated reliability at baseline (Cronbach's alpha= 0.826) and month one (Cronbach's alpha= 0.810). The distribution significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.01$, Shapiro-Wilk $p<0.001$) and month one (Kolmogorov-Smirnov $p<0.01$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratios for skewness were 0.349 at baseline and -1.12 at month one. The critical ratio for kurtosis was -2.65 at baseline and -2.13 at month one. As a result, anxiety was considered normal at baseline and month one in all remaining analyses.

Table 4.10. Normality Results for Constructs and Instrument Sub-Scales

Construct	Baseline				Month 1			
	Skewness TS (SE)	Kurtosis TS (SE)	Kolmogorov -Smitnov TS	Shapiro-Wilk TS	Skewness TS (SE)	Kurtosis TS (SE)	Kolmogorov -Smitnov TS	Shapiro-Wilk TS
Age	0.449 (0.211)	-0.534 (0.419)	0.110**	0.959*				
Number of Medications	0.472 (0.211)	-0.433 (0.419)	0.102*	0.969*				
Health Literacy	0.400 (0.211)	-0.762 (0.419)	0.200**	0.897**				
Uncertainty Discrepancy	0.212 (0.212)	0.963 (0.422)	0.152**	0.918**	-0.142 (0.217)	-0.388 (0.430)	0.148**	0.949**
Anxiety	0.074 (0.212)	-1.117 (0.422)	0.100*	0.943**	-0.243 (0.217)	-0.914 (0.430)	0.109*	0.948**
Positive Outcome Expectancies	-0.573 (0.212)	-0.457 (0.422)	0.128**	0.935**	-0.660 (0.217)	-0.434 (0.431)	0.125**	0.923**
Negative Outcome Expectancies	0.112 (0.213)	-0.686 (0.423)	0.094*	0.982	0.030 (0.217)	-0.584 (0.431)	0.062	0.986
Communication Efficacy	-1.600 (0.212)	1.664 (0.422)	0.233**	0.759**	-1.899 (0.217)	3.145 (0.430)	0.241**	0.732**
Coping Efficacy	-0.747 (0.213)	0.455 (0.423)	0.101**	0.946**	-0.781 (0.218)	0.498 (0.433)	0.089	0.948**
Target Efficacy- Pharmacists	-1.104 (0.212)	0.639 (0.422)	0.156**	0.890**	-1.114 (0.217)	0.749 (0.430)	0.167**	0.883**
Target Efficacy- Physicians	-0.817 (0.213)	-0.024 (0.423)	0.127**	0.926**	-0.790 (0.217)	-0.060 (0.430)	0.156**	0.922**

Table 4.10. continued

Construct	Baseline				Month 1			
	Skewness TS (SE)	Kurtosis TS (SE)	Kolmogorov-Smitnov TS	Shapiro-Wilk TS	Skewness TS (SE)	Kurtosis TS (SE)	Kolmogorov-Smitnov TS	Shapiro-Wilk TS
Active Seeking- Pharmacist	0.739 (0.212)	0.242 (0.422)	0.189**	0.901**				
Active Seeking- MD	0.097 (0.212)	-1.139 (0.422)	0.120**	0.923**				
Avoidance- Pharmacist	1.002 (0.214)	-0.058 (0.425)	0.285**	0.792**				
Medication Beliefs- Overuse	-0.023 (0.211)	-0.719 (0.419)	0.090	0.966*	-0.154 (0.216)	-0.762 (0.428)	0.096*	0.965*
Avoidance- MD	1.045 (0.212)	-0.019 (0.422)	0.305**	0.774**				
Total PMK	-0.169 (0.212)	-0.212 (0.420)	0.067	0.985	-0.023 (0.219)	-0.239 (0.435)	0.045	0.992
Medication Beliefs- Necessity	-0.681 (0.211)	-0.477 (0.419)	0.130**	0.910**	-0.694 (0.216)	-0.480 (0.428)	0.157**	0.907**
Medication Beliefs- Concern	0.511 (0.211)	-0.376 (0.419)	0.117**	0.933**	0.340 (0.216)	-0.546 (0.428)	0.120**	0.944**
Medication Beliefs- Harm	0.690 (0.211)	-0.094 (0.419)	0.131**	0.934**	0.614 (0.217)	-0.246 (0.430)	0.116**	0.940*

TS= Test Statistic

SE= Standard Error

*P<0.01

** P<0.001

Outcome Assessments

Outcome assessments were measured as two separate constructs: positive outcome expectancies (5 items) and negative outcome expectancies (5 items). The positive outcome expectancies subscale demonstrated reliability at baseline (Cronbach's alpha= 0.799) and month one (Cronbach's alpha= 0.863). The distribution significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) and month one (Kolmogorov-Smirnov <0.001, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was -2.70 at baseline and -3.04 at month one. The critical ratio for kurtosis was -1.08 at baseline and -1.01 at month one. As a result, the positive outcome expectancies subscale was considered normal at baseline and month one in all remaining analyses.

The negative outcome expectancies did not meet the criteria for reliability at baseline (Cronbach's alpha= 0.616), but demonstrated reliability at month one (Cronbach's alpha= 0.714). At baseline, the item-subscale correlations for all items were >0.3, and the overall Cronbach's alpha did not improve with the deletion of any single item (see Table 4.7). Based on these results, all items were retained in the construct for the remaining analyses. The normality tests gave conflicting results at baseline (Kolmogorov-Smirnov $p<0.01$, Shapiro-Wilk $p>0.05$). The distribution did not differ from normal at month one (Kolmogorov-Smirnov >0.05, Shapiro-Wilk $p>0.05$) according to the tests of normality. The critical ratio for skewness was 0.526 at baseline and 0.138 at month one. The critical ratio for kurtosis were -1.62 at baseline and -1.35 at month one. As a result, the negative outcome expectancies subscale was considered normal at baseline and month one in all remaining analyses.

Communication Efficacy

Communication efficacy was measured with three items and demonstrated reliability at baseline (Cronbach's alpha= 0.894) and month one (Cronbach's alpha= 0.888). The distribution significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) and month one (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was -7.55 at baseline and -8.75 at month one. The critical ratios for kurtosis was 3.94 at baseline and 7.31 at month one. As a result, the

communication efficacy subscale was considered non-normal at baseline and month one in all remaining analyses.

Coping Efficacy

Coping efficacy was measured with five items and demonstrated reliability at baseline (Cronbach's alpha= 0.705) and month one (Cronbach's alpha= 0.725). The distribution significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.01$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The normality tests gave conflicting results at month one (Kolmogorov-Smirnov $p>0.05$, Shapiro-Wilk $p<0.001$). The critical ratio for skewness was -3.51 at baseline and -3.58 at month one. The critical ratios for kurtosis were 1.08 at baseline and 1.15 at month one. As a result, the coping efficacy subscale was considered non-normal at baseline and month one in all remaining analyses.

Target Efficacy

Target efficacy for pharmacists was measured with six items and demonstrated reliability at baseline (Cronbach's alpha= 0.881) and month one (Cronbach's alpha= 0.891). The distribution significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) and month one (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was -5.21 at baseline and -5.13 at month one. The critical ratio for kurtosis was 1.51 at baseline and 1.74 at month one. As a result, the target efficacy subscale was considered non-normal at baseline and month one in all remaining analyses.

Target efficacy for physicians was measured with six items and demonstrated reliability at baseline (Cronbach's alpha= 0.866) and month one (Cronbach's alpha= 0.894). The distribution significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) and month one (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was -3.84 at baseline and -3.64 at month one. The critical ratio for kurtosis was -0.02 at baseline and -0.14 at month one. As a result, the target efficacy subscale was considered non-normal at baseline and month one in all remaining analyses.

Medication Information Seeking Behaviors

All medication information seeking behaviors were measured as a single item at a single time point (baseline), and reliability analysis was not completed. The distribution of active information seeking from a pharmacist significantly differed from normal (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was 3.49 , and the critical ratio for kurtosis was 0.57 . The distribution of information avoidance from a pharmacist significantly differed from normal (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was 4.68 , and the critical ratio for kurtosis was -0.14. As a result, active information seeking was considered non-normal at baseline and month one in all remaining analyses.

The distribution of active information seeking from a physician significantly differed from normal (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was 0.458 , and the critical ratio for kurtosis was -2.70 . The distribution of information avoidance from a physician significantly differed from normal (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk $p<0.001$) according to the tests of normality. The critical ratio for skewness was 4.93 , and the critical ratio for kurtosis was -0.05. As a result, information avoidance was considered non-normal at baseline and month one in all remaining analyses.

Medication Knowledge

Medication knowledge was measured as 10 single items. Although some previous studies attempted to divide knowledge scores into sub-scales, sub-scales were not utilized in this data set, due to very poor reliability (<0.3 for all potential sub-scales) and past literature suggesting that knowledge is known to vary significantly based on domain. Items were analyzed as single items, and the total score for all items was also calculated. The distribution of total medication knowledge scores did not significantly differ from normal at baseline (Kolmogorov-Smirnov $p>0.05$, Shapiro-Wilk $p>0.05$) or month one (Kolmogorov-Smirnov $p>0.05$, Shapiro-Wilk $p>0.05$) according to the tests of normality. The critical ratio for skewness was -0.80 at baseline and -0.11 at month one. The critical ratio for kurtosis was -0.50 at baseline and -0.55 at month one. As a result, the total

medication knowledge score was considered normal at baseline and month one in all remaining analyses.

Medication Beliefs

Medication beliefs were measured as four independent sub-scales: necessity, concern, harm, and overuse. The necessity subscale demonstrated reliability at baseline (Cronbach's alpha= 0.859) and month one (Cronbach's alpha= 0.856). The data significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk <0.001) and month one (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk <0.001) according to the tests of normality. The critical ratio for skewness was -3.23 at baseline and -3.21 at month one. The critical ratio for kurtosis was -1.14 at baseline and -1.12 at month one. As a result, the necessity subscale was considered normal at baseline and month one in all remaining analyses.

The concern subscale did not meet the criteria for reliability at baseline (Cronbach's alpha= 0.685) or month one (Cronbach's alpha= 0.652). The item-subscale correlations for all items were >0.3, and the overall Cronbach's alpha did not improve with the deletion of any single item (see Tables 4.8 & 4.9). Based on these results, all items were retained in the construct for the remaining analyses. The data significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk <0.001) and month one (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk <0.001) according to the tests of normality. The critical ratio for skewness was 2.42 at baseline and 1.57 at month one. The critical ratio for kurtosis was -0.90 at baseline and -1.28 at month one. As a result, the concern subscale was considered normal at baseline and month one in all remaining analyses.

The harm subscale demonstrated reliability at baseline (Cronbach's alpha= 0.783) and month one (Cronbach's alpha= 0.770). The data significantly differed from normal at baseline (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk <0.001) and month one (Kolmogorov-Smirnov $p<0.001$, Shapiro-Wilk <0.001) according to the tests of normality. The critical ratio for skewness was 3.27 at baseline and 2.82 at month one. The critical ratio for kurtosis was -0.22 at baseline and -0.57 at month one. As a result, the harm subscale was considered normal at baseline and month one in all remaining analyses.

The overuse subscale demonstrated reliability at baseline (Cronbach's alpha= 0.839) and month one (Cronbach's alpha= 0.869). The normality tests gave conflicting results at baseline (Kolmogorov-Smirnov $p>0.05$, Shapiro-Wilk <0.01). The data significantly differed from normal

at month one (Kolmogorov-Smirnov $p<0.01$, Shapiro-Wilk <0.01) according to the tests of normality. The critical ratio for skewness was -0.11 at baseline and -0.71 at month one. The critical ratios for kurtosis was -1.72 at baseline and -1.78 at month one. As a result, the overuse subscale was considered normal at baseline and month one in all remaining analyses.

4.2.2 Attitudes About Medication Information Seeking

Uncertainty Discrepancy

Uncertainty discrepancy was calculated by subtracting participant's current level of uncertainty about their medications from their desired uncertainty. Current and desired uncertainty were measured on a seven-point Likert scale with a score of one being "completely uncertain" and seven being "completely certain." At baseline, 23.1% of participants reported that they were completely certain about their medications, while 75.4% reported wanting to be completely certain (see Table 4.11). At month one, the percentage of participants reporting that they were completely certain decreased to 11.2%, while 72% continued to report wanting to be completely certain (see Table 4.12).

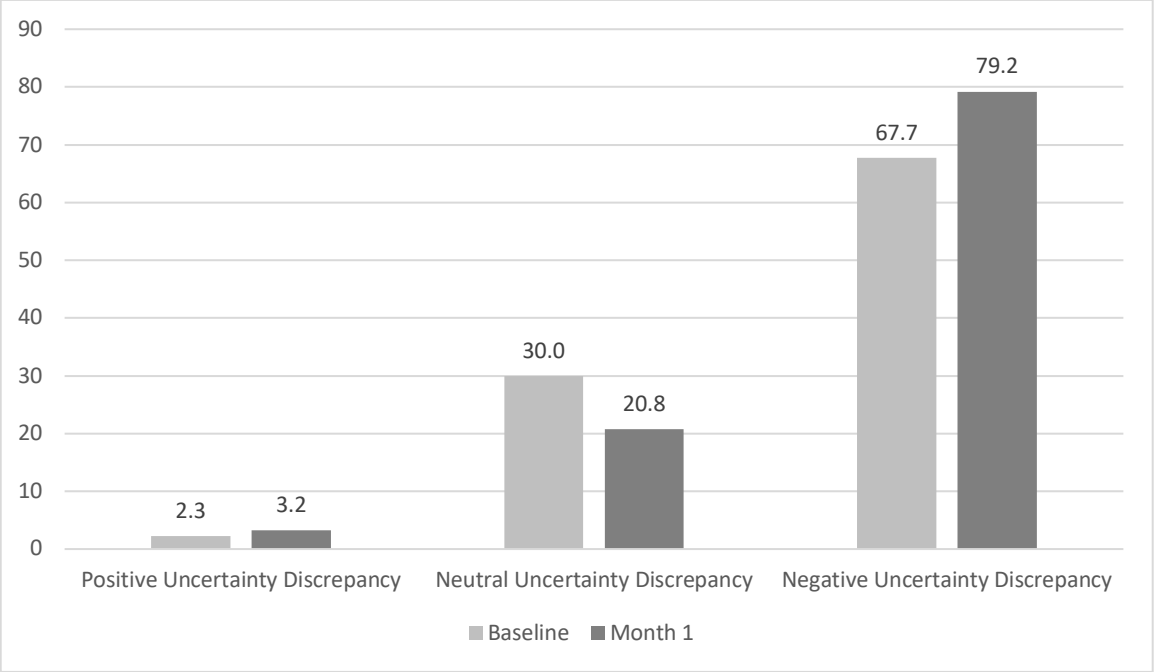
After calculating the uncertainty discrepancy, or the difference between participants current and desired level of uncertainty, scores were divided into three groups: those with negative uncertainty discrepancy (those that want more uncertainty about medications), neutral uncertainty discrepancy (those that want the same amount of uncertainty about medications as they currently have) and positive uncertainty discrepancy (those want less uncertainty about medications). A majority of participants (67.7%) reported wanting less uncertainty than they currently had about their medications, and that percentage increased to 79.2% at month one (see Figure 4.1). Thirty percent of participants reported wanting no change in their current level of certainty at baseline, (20.8% at month one), and 2.3% wanted to be less certain than they currently were about their medications (3.2% at month one).

Table 4.11. Participants' Attitudes About Information Seeking at Baseline (Uncertainty Scales) (N=130)

Uncertainty Discrepancy	Completely Uncertain n (%)	Uncertain n (%)	Slightly Uncertain n (%)	Neutral n (%)	Slightly Certain n (%)	Certain n (%)	Completely Certain n (%)
Overall, how certain are you that you know everything you need to know about your medications?	8 (6.2)	9 (6.9)	13 (10.0)	21 (16.1)	27 (20.8)	22 (16.9)	30 (23.1)
Overall, how certain do you want to be that you know everything you need to know about your medications?	4 (3.1)	0 (0.0)	0 (0.0)	5 (3.8)	5 (3.8)	18 (13.9)	98 (75.4)

Table 4.12. Participants' Attitudes About Information Seeking at Month One (Uncertainty Scales)

Uncertainty Discrepancy	Completely Uncertain n (%)	Uncertain n (%)	Slightly Uncertain n (%)	Neutral n (%)	Slightly Certain n (%)	Certain n (%)	Completely Certain n (%)
Overall, how certain are you that you know everything you need to know about your medications?	6 (4.8)	9 (7.2)	22 (17.6)	32 (25.6)	26 (20.8)	16 (12.8)	14 (11.2)
Overall, how certain do you want to be that you know everything you need to know about your medications?	2 (1.6)	1 (0.8)	0 (0.0)	2 (1.6)	9 (7.2)	21 (16.8)	90 (72.0)



Negative Uncertainty Discrepancy= those that want more uncertainty about medications
Neutral Uncertainty Discrepancy= those that want the same amount of uncertainty about medications as they currently have)
Positive Uncertainty Discrepancy= those want less uncertainty about medications

Figure 4.1. Uncertainty Discrepancy at Baseline and Month One

Issue Importance

Issue importance was measured as a single item on a seven-point Likert scale with a score of one being "completely uncertain" and seven being "completely certain." A majority of participants (71.5%) reported that it was important to know about their medications.

Anxiety

Anxiety was calculated as the mean score across two items. All items were measured on a seven-point Likert scale with a score of one being "completely disagree" and seven being "completely agree." Participants reported varying levels of worry about their uncertainty discrepancy at baseline and month one. Twenty-nine percent of participants agreed or strongly agreed that the difference between how much they knew about their medication and wanted to know about their medication made them anxious, and 37.7% disagreed or strongly disagreed. Twenty-six percent of participants agreed or strongly agreed that the difference between how much

they knew about their medication and wanted to know about their medication worried them, and 37.7% disagreed. (see Table 4.13). At month one, 34 percent of participants agreed or strongly agreed that their uncertainty worried them and 38.4% agreed or strongly agreed that their uncertainty made them anxious (see Table 4.14).

Table 4.13. Participants' Attitudes About Information Seeking at Baseline (Agreement Scales) (N=130)

	Strongly Disagree n (%)	Disagree n (%)	Somewhat Disagree n (%)	Neither Agree Nor Disagree n (%)	Somewhat Agree n (%)	Agree n (%)	Strongly Agree n (%)
Issue Importance							
It is important to me that I know about my medications.*	2 (1.5)	0 (0.0)	1 (0.8)	8 (6.2)	5 (3.8)	21 (16.2)	93 (71.5)
Anxiety							
It worries me when I compare how little I know about my medications to how much I want to know.*	15 (11.5)	19 (14.6)	12 (9.2)	33 (25.4)	17 (13.1)	18 (13.8)	16 (12.3)
It makes me anxious to think about difference between how much I want to know about my medications and how much I actually know.*	26 (20.0)	23 (17.7)	12 (9.2)	22 (16.9)	9 (6.9)	17 (13.1)	21 (16.2)
Communication efficacy							
I know what to say to get information about my medications from a pharmacist.*	12 (9.2)	7 (5.4)	3 (2.3)	4 (3.1)	10 (7.7)	37 (28.5)	57 (43.8)
I know what questions to ask a pharmacist about my medications.*	5 (3.8)	7 (5.4)	5 (3.8)	6 (4.6)	15 (11.5)	33 (25.4)	59 (45.4)
I am confident I can approach a pharmacist to talk about my medications.*	3 (2.3)	9 (6.9)	0 (0.0)	4 (3.1)	12 (9.2)	36 (27.7)	66 (50.8)

Table 4.13 continued

	Strongly Disagree N (%)	Disagree N (%)	Somewhat Disagree N (%)	Neither Agree Nor Disagree N (%)	Somewhat Agree N (%)	Agree N (%)	Strongly Agree N (%)
Target efficacy							
A pharmacist would be completely honest about my medications.*	0 (0.0)	4 (3.1)	5 (3.8)	24 (18.5)	12 (9.2)	21 (16.2)	64 (49.2)
A pharmacist is available to talk to me about my medications.*	2 (1.5)	3 (2.3)	4 (3.1)	16 (12.3)	14 (10.8)	26 (20.0)	65 (50.0)
A pharmacist typically wants to talk to me about my medications.*	4 (3.1)	10 (7.7)	4 (3.1)	32 (24.6)	24 (18.5)	23 (17.7)	33 (25.4)
A pharmacist has the time to talk to me about my medications.*	7 (5.4)	7 (5.4)	12 (9.2)	17 (13.1)	17 (13.1)	29 (22.3)	41 (31.5)
A pharmacist can provide me with the information I want about my medications.*	1 (0.8)	1 (0.8)	4 (3.1)	8 (6.2)	12 (9.2)	34 (26.1)	70 (53.8)
A pharmacist has complete information about medications.*	0 (0.0)	9 (6.9)	5 (3.9)	12 (9.2)	13 (10.0)	30 (23.1)	61 (46.9)

*n=130

**n=129

Table 4.14. Participants' Attitudes About Information Seeking at Month One (Agreement Scales)

	Strongly Disagree N (%)	Disagree N (%)	Somewhat Disagree N (%)	Neither Agree Nor Disagree N (%)	Somewhat Agree N (%)	Agree N (%)	Strongly Agree N (%)
Issue Importance							
It is important to me that I know about my medications.*	0 (0.0)	1 (0.8)	1 (0.8)	4 (3.2)	8 (6.4)	42 (33.6)	69 (55.2)
Anxiety							
It worries me when I compare how little I know about my medications to how much I want to know.*	6 (4.8)	15 (12.0)	13 (10.4)	20 (16.0)	23 (18.4)	26 (20.8)	22 (17.6)
It makes me anxious to think about difference between how much I want to know about my medications and how much I actually know.*	14 (11.2)	19 (15.2)	11 (8.8)	26 (20.8)	13 (10.4)	18 (14.4)	24 (19.2)
Communication efficacy							
I know what to say to get information about my medications from a pharmacist.*	6 (4.8)	4 (3.2)	6 (4.8)	6 (4.8)	8 (6.4)	36 (28.8)	59 (47.2)
I know what questions to ask a pharmacist about my medications.*	6 (4.8)	6 (4.8)	3 (2.4)	6 (4.8)	13 (10.4)	31 (24.8)	60 (48.0)
I am confident I can approach a pharmacist to talk about my medications.*	4 (3.2)	4 (3.2)	2 (1.6)	4 (3.2)	10 (8.0)	29 (23.2)	72 (57.6)

*N=125

Table 4.14 continued

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Agree	Strongly Agree
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Target efficacy							
A doctor would be completely honest about my medications.*	0 (0.0)	5 (4.0)	5 (4.0)	14 (11.2)	14 (11.2)	33 (26.4)	54 (43.2)
A doctor is available to talk to me about my medications.*	5 (4.0)	9 (7.2)	14 (11.2)	13 (10.4)	12 (9.6)	32 (25.6)	40 (32.0)
A doctor typically wants to talk to me about my medications.*	3 (2.4)	4 (3.2)	8 (6.4)	18 (14.4)	21 (16.8)	34 (27.2)	37 (29.6)
A doctor has the time to talk to me about my medications.*	4 (3.2)	6 (4.8)	11 (8.8)	19 (15.2)	25 (20.0)	24 (19.2)	36 (28.8)
A doctor can provide me with the information I want about my medications.*	2 (1.6)	6 (4.8)	7 (5.6)	18 (14.4)	21 (16.8)	30 (24.0)	41 (32.8)
A doctor has complete information about medications.*	3 (2.4)	9 (7.2)	6 (4.8)	20 (16.0)	23 (18.4)	32 (25.6)	32 (25.6)

*N=125

Communication Efficacy

Communication efficacy was calculated as the mean score across three items. All items were measured on a seven-point Likert scale with a score of one being "completely disagree" and seven being "completely agree." A majority of participants had high communication efficacy scores at baseline and month one. At baseline, 43.8% of participants strongly agreed that they knew what to say to get information about their medications from a pharmacist, 45.4% strongly agreed that they knew what questions to ask a pharmacist about their medication, and 50.8% strongly agreed they were confident they could approach a pharmacist to talk about their medications (see Table 4.12). At month one, 47.2% of participants strongly agreed that they knew what to say to get information about their medications from a pharmacist, 48.0% strongly agreed that they knew what questions to ask a pharmacist about their medication, and 57.6% strongly agreed they were confident they could approach a pharmacist to talk about their medications (see Table 4.14).

Target Efficacy

Target efficacy was calculated as the mean score across six items. All items were measured on a seven-point Likert scale with a score of one being "completely disagree" and seven being "completely agree." Fifty-four percent of participants strongly agreed that pharmacists could provide them with the information they wanted about their medications. Twenty-five percent of participants strongly agreed that pharmacists wanted to talk to them (25.4%). Twice as many participants strongly agreed that pharmacists were available to talk to them about their medications (50.0%) than strongly agreed that pharmacists wanted to talk to them about their medications (25.4%) (see Table 4.14).

Outcome Assessments

Outcome assessments included two sub-scales: positive outcome expectancies and negative outcome expectancies. Positive and negative outcome expectances were each calculated as the mean score across five items. All items were measured on a seven-point Likert scale with a score of one being "extremely unlikely" and seven being "completely likely." At baseline, 70.7% of participants reported that it was quite likely or extremely likely that they would know more about their medicines if they asked a pharmacist about their medication. Forty-one percent of

participants reported that it was quite likely or extremely likely that they would have less problems with their medicines if they asked a pharmacist about their medications (see Table 4.14). At month one, 69.4% of participants reported that it was quite likely or extremely likely that they would know more about their medicines if they asked a pharmacist about their medications. Forty-seven percent of participants reported that it was quite likely or extremely likely that they would have less problems with their medicines (see Table 4.15).

For negative outcome expectancies, 23.1% of participants at baseline and 22.6% of participants at month one reported that it was quite likely or extremely likely that other patients that are waiting would get upset if they asked a pharmacists questions about their medication (see Tables 4.15 and 4.16). Fifteen percent of participants at baseline and 20% of participants at month one reported that it was quite likely or extremely likely that they would look uneducated if they asked a pharmacist questions about their medications.

Coping Efficacy

Coping efficacy was calculated as the mean score across five items. All items were measured on a seven-point Likert scale with a score of one being "extremely unable" and seven being "extremely able." At baseline, 53.1% of participants reported they were extremely able to cope with spending a longer amount of time in the pharmacy. At month one, 46.3% reported they were extremely able to cope with spending a longer amount of time in the pharmacy (see Tables 4.17 and 4.18). At baseline, 21.7% of participants reported that they were extremely able to cope with information they received from a pharmacist that was overwhelming. At month one, 22.0% reported they were extremely able to cope with information they received from a pharmacist that was overwhelming.

Table 4.15. Participants' Attitudes About Information Seeking at Baseline (Likelihood Scales)

	Extremely Unlikely N (%)	Quite Unlikely N (%)	Slightly Unlikely N (%)	Neither Likely Nor Unlikely N (%)	Slightly Likely N (%)	Quite Likely N (%)	Extremely Likely N (%)
Outcome Assessments							
If I ask the pharmacist about my medication, I will get more benefit from my medication.*	5 (3.9)	6 (4.6)	4 (3.1)	28 (21.5)	19 (14.6)	28 (21.5)	40 (30.8)
If I ask the pharmacist about my medications, I will know more about my medicine.*	1 (0.8)	5 (3.9)	2 (1.5)	17 (13.1)	13 (10.0)	25 (19.2)	67 (51.5)
If I ask the pharmacist about my medications, my confidence in managing my medication will increase.*	5 (3.8)	8 (6.2)	5 (3.9)	14 (10.8)	11 (8.5)	35 (26.9)	52 (40.0)
If I ask the pharmacist about my medications, my chances of having problems with the medicine will decrease.*	15 (11.5)	20 (15.4)	5 (3.9)	18 (13.8)	19 (14.6)	26 (20.0)	27 (20.8)
If I ask the pharmacist about my medications, it will be easier to take my medicine correctly.*	6 (4.6)	9 (6.9)	5 (3.9)	11 (8.5)	18 (13.8)	31 (23.8)	50 (38.5)
If I ask the pharmacist about my medications, it will remind me that I am sick or unwell.*	30 (23.1)	14 (10.8)	6 (4.6)	36 (27.7)	12 (9.2)	16 (12.3)	16 (12.3)
If I ask the pharmacist about my medications, other patients that are waiting will get upset.*	18 (13.8)	17 (13.1)	5 (3.9)	25 (19.2)	23 (17.7)	12 (9.2)	30 (23.1)
If I ask the pharmacist about my medications, I will look uneducated.*	51 (39.2)	32 (24.6)	3 (2.3)	14 (10.8)	10 (7.7)	10 (7.7)	10 (7.7)
If I ask the pharmacist about my medications, the information I get will be overwhelming.*	21 (16.3)	33 (25.6)	19 (14.7)	20 (15.5)	15 (11.6)	14 (10.9)	7 (5.4)
If I ask the pharmacist about my medications, I will have to spend more time in the pharmacy.*	19 (14.6)	19 (14.6)	9 (6.9)	18 (13.9)	14 (10.8)	19 (14.6)	32 (24.6)

*N=130

Table 4.16. Participants' Attitudes About Information Seeking at Month One (Likelihood Scales)

Outcome Assessments	Extremely Unlikely N (%)	Quite Unlikely N (%)	Slightly Unlikely N (%)	Neither Likely Nor Unlikely N (%)	Slightly Likely N (%)	Quite Likely N (%)	Extremely Likely N (%)
If I ask the pharmacist about my medication, I will get more benefit from my medication.*	3 (2.4)	5 (4.1)	8 (6.5)	21 (16.9)	21 (16.9)	31 (25.0)	35 (28.2)
If I ask the pharmacist about my medications, I will know more about my medicine.*	0 (0.0)	4 (3.2)	4 (3.2)	14 (11.3)	16 (12.9)	30 (24.2)	56 (45.2)
If I ask the pharmacist about my medications, my confidence in managing my medication will increase.*	2 (1.6)	9 (7.3)	4 (3.2)	17 (13.7)	12 (9.7)	33 (26.6)	47 (37.9)
If I ask the pharmacist about my medications, my chances of having problems with the medicine will decrease.*	8 (6.5)	13 (10.5)	10 (8.0)	15 (12.1)	20 (16.1)	28 (22.6)	30 (24.2)
If I ask the pharmacist about my medications, it will be easier to take my medicine correctly.*	8 (6.5)	8 (6.5)	2 (1.6)	10 (8.0)	20 (16.1)	29 (23.4)	47 (37.9)
If I ask the pharmacist about my medications, it will remind me that I am sick or unwell.*	21 (16.9)	19 (15.3)	7 (5.7)	20 (16.1)	23 (18.6)	14 (11.3)	20 (16.1)
If I ask the pharmacist about my medications, other patients that are waiting will get upset.*	13 (10.5)	13 (10.5)	10 (8.1)	18 (14.4)	27 (21.8)	15 (12.1)	28 (22.6)
If I ask the pharmacist about my medications, I will look uneducated.*	32 (25.8)	27 (21.8)	15 (12.1)	14 (11.2)	11 (8.9)	12 (9.7)	13 (10.5)
If I ask the pharmacist about my medications, the information I get will be overwhelming.*	14 (11.3)	23 (18.5)	20 (16.1)	21 (17.0)	18 (14.5)	19 (15.3)	9 (7.3)
If I ask the pharmacist about my medications, I will have to spend more time in the pharmacy.*	18 (14.5)	11 (8.9)	10 (8.1)	18 (14.5)	19 (15.3)	20 (16.1)	28 (22.6)

*N=125

Table 4.17. Participants' Attitudes About Information Seeking at Baseline (Ability Scales)

Coping Efficacy	Extremely Unable N (%)	Quite Unable N (%)	Slightly Unable N (%)	Neither Unable Nor Able N (%)	Slightly Able N (%)	Quite Able N (%)	Extremely Able N (%)
If you are reminded that you are sick or unwell, how able to cope with this situation are you?*	13 (10.1)	10 (7.7)	11 (8.5)	22 (17.1)	6 (4.7)	27 (20.9)	40 (31.0)
If other patients that are waiting get upset, how able to cope with this situation are you?*	9 (7.0)	14 (10.9)	16 (12.4)	15 (11.6)	15 (11.6)	15 (11.6)	45 (34.9)
If you look uneducated, how able to cope with this situation are you?*	14 (10.8)	10 (7.8)	12 (9.3)	13 (10.1)	11 (8.5)	20 (15.5)	49 (38.0)
If the information you get from a pharmacist is overwhelming, how able to cope with this situation are you?*	13 (10.1)	17 (13.2)	21 (16.3)	19 (14.7)	15 (11.6)	16 (12.4)	28 (21.7)
If you have to spend a longer amount of time in the pharmacy or physician's office, how able to cope with this situation are you?*	9 (6.9)	7 (5.4)	6 (4.6)	11 (8.5)	6 (4.6)	22 (16.9)	69 (53.1)

*N=130

Table 4.18. Participants' Attitudes About Information Seeking at Month One (Ability Scales)

Coping Efficacy	Extremely Unable N (%)	Quite Unable N (%)	Slightly Unable N (%)	Neither Unable Nor Able N (%)	Slightly Able N (%)	Quite Able N (%)	Extremely Able N (%)
If you are reminded that you are sick or unwell, how able to cope with this situation are you?*	7 (5.7)	8 (6.5)	13 (10.5)	21 (17.1)	12 (9.8)	22 (17.9)	40 (32.5)
If other patients that are waiting get upset, how able to cope with this situation are you?*	10 (8.1)	11 (8.9)	10 (8.1)	16 (12.9)	14 (11.2)	23 (18.5)	40 (32.3)
If you look uneducated, how able to cope with this situation are you?*	12 (9.8)	7 (5.7)	8 (6.5)	16 (13.0)	11 (8.9)	24 (19.5)	45 (36.6)
If the information you get from a pharmacist is overwhelming, how able to cope with this situation are you?*	10 (8.1)	16 (13.0)	11 (8.9)	19 (15.4)	20 (16.3)	20 (16.3)	27 (22.0)
If you have to spend a longer amount of time in the pharmacy or physician's office, how able to cope with this situation are you?*	7 (5.7)	10 (8.1)	4 (3.3)	14 (11.4)	5 (4.1)	26 (21.1)	57 (46.3)

*N=125

Mean Changes in Attitudes about Medication Information Seeking

Means and standard deviations for all attitude about medication information seeking variables at baseline and month one are presented in Table 4.19. The mean for current level of participant certainty about their medications decreased (from 4.82 to 4.34), while the mean for desired certainty increased (from 6.48 to 6.50). All items in the anxiety and communication efficacy constructs increased from baseline to month one, while items in target efficacy, coping efficacy, and outcome assessments varied in between baseline and month one.

4.2.3 Medication Information Seeking Behaviors

Medication Information Seeking Behaviors

When asked to report their information seeking behaviors over the previous six months, 21.5% of participants reported never asking a pharmacist questions about their medications, and 13.8% of participants reported never asking a physician questions about their medications (see Table 4.20). A higher percentage of participants reported asking a physician questions (37.6%) frequently, usually, or every time when compared to pharmacists (13.1%). A higher percentage of participants also reported passive seeking of information from physicians frequently, usually or every time (23.0%) as comparted to pharmacists (15.4%).

Participants were also asked to report their information seeking from friends and family and the internet. More than half of participants at baseline reported never asking friends and family questions about the medications (56.9%) and never searching the internet for answers to questions about their medications (61.2%) at baseline. Approximately 20.0% of participants reported they search for answers to questions about their medication using the internet frequently, usually, or every time (see Table 4.20).

Table 4.19. Changes in Participants' Attitudes About Information Seeking Between Baseline and Month One

	N	Baseline Mean (SD)	N	Month One Mean (SD)
Issue Importance				
It is important to me that I know about my medications.*	130	6.45 (1.12)	125	6.37 (0.90)
Anxiety				
It worries me when I compare how little I know about my medications to how much I want to know.**	130	4.05 (1.88)	125	4.64 (1.80)
It makes me anxious to think about difference between how much I want to know about my medications and how much I actually know.**	130	3.77 (2.15)	125	4.24 (2.02)
Communication efficacy				
I know what to say to get information about my medications from a pharmacist.*	130	5.55 (1.96)	125	5.80 (1.69)
I know what questions to ask a pharmacist about my medications.	130	5.72 (1.69)	125	5.78 (1.71)
I am confident I can approach a pharmacist to talk about my medications.	130	5.96 (1.56)	125	6.10 (1.50)
Target efficacy				
A pharmacist would be completely honest about my medications.	130	5.79 (1.46)	125	5.86 (1.39)
A pharmacist is available to talk to me about my medications.	130	5.88 (1.46)	125	6.02 (1.34)
A pharmacist typically wants to talk to me about my medications.**	130	5.02 (1.66)	125	5.34 (1.53)
A pharmacist has the time to talk to me about my medications.*	130	5.16 (1.83)	125	5.42 (1.77)
A pharmacist can provide me with the information I want about my medications.	130	6.16 (1.21)	125	6.08 (1.20)
A pharmacist has complete information about medications.	130	5.79 (1.54)	125	5.80 (1.49)

Issue Importance: 1=Strongly Disagree, 7= Strongly Agree

Anxiety: 1=Strongly Disagree, 7= Strongly Agree

Communication Efficacy: 1=Strongly Disagree, 7= Strongly Agree

Target Efficacy: 1=Strongly Disagree, 7= Strongly Agree

Table 4.19 continued

	N	Baseline Mean (SD)	N	Month One Mean (SD)
Uncertainty Discrepancy				
Overall, how certain are you that you know everything you need to know about your medications?**	130	4.82 (1.80)	125	4.34 (1.59)
Overall, how certain do you want to be that you know everything you need to know about your medications?	130	6.48 (1.22)	125	6.50 (1.07)
Positive Outcome Expectancies				
If I ask the pharmacist about my medication, I will get more benefit from my medication.	130	5.26 (1.66)	124	5.30 (1.58)
If I ask the pharmacist about my medications, I will know more about my medicine.	130	5.92 (1.45)	124	5.87 (1.36)
If I ask the pharmacist about my medications, my confidence in managing my medication will increase.	130	5.55 (1.74)	124	5.54 (1.64)
If I ask the pharmacist about my medications, my chances of having problems with the medicine will decrease.**	130	4.48 (2.08)	124	4.85 (1.90)
If I ask the pharmacist about my medications, it will be easier to take my medicine correctly.	130	5.45 (1.79)	124	5.43 (1.83)

Uncertainty Discrepancy: 1=Completely Uncertain, 7= Completely Certain

Positive Outcome Expectancies: 1=Extremely Unlikely, 7= Extremely Likely

Table 4.19 continued

	N	Baseline Mean (SD)	N	Month One Mean (SD)
Negative Outcome Expectancies				
If I ask the pharmacist about my medications, it will remind me that I am sick or unwell.*	130	3.75 (2.05)	124	4.02 (2.08)
If I ask the pharmacist about my medications, other patients that are waiting will get upset.	130	4.34 (2.09)	124	4.53 (1.98)
If I ask the pharmacist about my medications, I will look uneducated.**	130	2.77 (2.03)	124	3.27 (2.06)
If I ask the pharmacist about my medications, the information I get will be overwhelming.**	129	3.35 (1.81)	124	3.80 (1.82)
If I ask the pharmacist about my medications, I will have to spend more time in the pharmacy.	130	4.34 (2.19)	124	4.46 (2.10)
Coping Efficacy				
If you are reminded that you are sick or unwell, how able to cope with this situation are you?	129	4.85 (2.07)	123	5.02 (1.90)
If other patients that are waiting get upset, how able to cope with this situation are you?	129	4.84 (2.06)	124	4.95 (2.01)
If you look uneducated, how able to cope with this situation are you?	129	4.96 (2.15)	123	5.11 (2.04)
If the information you get from a pharmacist is overwhelming, how able to cope with this situation are you?	129	4.29 (2.03)	123	4.55 (1.96)
If you have to spend a longer amount of time in the pharmacy or physician's office, how able to cope with this situation are you?	130	5.62 (1.95)	123	5.49 (1.94)

Negative Outcome Expectancies: 1=Extremely Unlikely, 7= Extremely Likely

Coping Efficacy: 1=Extremely Unable, 7= Extemely Able

*Statistically significant change based on Wilcoxon-signed rank test ($p<0.05$)

**Statistically significant change based on Wilcoxon-signed rank test ($p<0.01$)

Table 4.20. Communication Efficacy Difference in Mean Based on Information Seeking During Refill Dispensing

	Information Exchanged After Dispensing	N	Mean	St. Deviation	St. Error Mean
Communication Efficacy	No	94	5.642	1.592	0.164
	Yes	30	6.633	0.651	0.119

Table 4.21. Participants' Medication Information Management Behaviors (MIMB) Over Previous Six Months

		Never	Rarely	Occasionally	Sometimes	Frequently	Usually	Every time
	Mean (SD)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Asked a pharmacist questions about my medications.	2.90 (1.53)	28 (21.5)	25 (19.2)	40 (30.8)	20 (15.4)	7 (5.4)	6 (4.6)	4 (3.1)
Avoided asking a pharmacist questions about my medications, even though I wanted or needed to ask a question.	2.48 (1.81)	63 (49.2)	12 (9.4)	18 (14.1)	15 (11.7)	10 (7.8)	4 (3.1)	6 (4.7)
Talked to a pharmacist in hopes that they would answer my questions about my medicines without me asking.	2.18 (1.85)	78 (60.0)	16 (12.3)	10 (7.7)	6 (4.6)	8 (6.2)	4 (3.0)	8 (6.2)
Asked a friend or family member questions about my medicines.	2.24 (1.72)	74 (56.9)	11 (8.5)	14 (10.8)	14 (10.8)	8 (6.2)	6 (4.6)	3 (2.3)
Searched the internet for answers to questions about my medications.	2.37 (2.09)	79 (61.2)	11 (8.4)	7 (5.4)	6 (4.7)	8 (6.2)	6 (4.7)	12 (9.3)
Asked a doctor questions about my medications.	3.92 (1.96)	18 (13.8)	18 (13.8)	21 (16.1)	24 (18.5)	15 (11.5)	16 (12.3)	18 (13.8)
Avoided asking a doctor questions about my medications, even though I wanted or needed to ask a question.	2.27 (1.63)	68 (52.3)	16 (12.3)	13 (10.0)	17 (13.1)	10 (7.7)	4 (3.1)	2 (1.5)
Talked to a doctor in hopes that they would answer my questions about me medications without me asking.	2.50 (2.15)	78 (60.0)	8 (6.2)	7 (5.4)	7 (5.4)	9 (6.9)	10 (7.7)	11 (8.4)

Information Exchange at Baseline

At baseline, 37.7% of participants reported exchanging information about their medication at initial prescribing (see Table 4.21). Fewer participants (14.6%) reported exchanging information about their medication at initial dispensing. A majority of participants (66.9%) reported seeking additional information after they took the medication home. Over half (52.3%) reported reading the information that came with the medication.

Information Exchange at Month One

At month one, 24.6% of participants reported exchanging information during refill dispensing (see Table 4.22). All but one of those information exchanges (N=31) were initiated by the patient and not by the pharmacist. A smaller percentage of participants reported seeking additional information after they had their medication at home (19.0%).

4.2.4 Medication Outcomes

Medication Knowledge

Medication knowledge was measured as an average score of thirteen individual items. Participants could be scored as incorrect (-1), no answer (0), incomplete correct answer (1) or complete correct answer (2). Frequency scores for medication knowledge items at baseline (see Table 4.23) and month one (see Table 4.24) are accompanied by the percentage agreement between scorers for each item. At baseline, participants were most likely to be scored correct for usage instructions (Scorer 1: 74.2%, Scorer 2: 69.7%) and indication (Scorer 1: 62.9%, Scorer 2: 69.7%), and most likely to be scored incorrect for contraindications/warnings/ precautions (Scorer 1: 28.8%, Scorer 2: 32.6%). At month one, participants were most likely to be scored correct for frequency timing (Scorer 1: 75.2%, Scorer 2: 62.4%), usage instructions (Scorer 1: 72.8%, Scorer 2: 70.4%), and indication (Scorer 1: 66.7%, Scorer 2: 69.6%), and most likely to be scored incorrect for contraindications/warnings/ precautions (Scorer 1: 34.4%, Scorer 2: 28.8%). The mean from the two scorers represented the final percentage correct for each item.

Mean changes from baseline to month one are presented in Table 4.25. Mean scores increased for effectiveness, duration of treatment, timing in relation to meals, side effects response, contraindications/warnings/ precautions, and decreased for indication, name and interactions.

Table 4.22. Participants' Medication Information Management Behaviors at Baseline (N=130)

	n	%
Information Seeking During Initial Prescribing		
Yes	49	37.7
No	81	62.3
Prescribing Source of Information		
Doctor	64	49.2
Nurse	19	14.6
Information Seeking During Initial Dispensing		
Yes	19	14.6
No	111	85.4
Type of Counseling		
Patient-Initiated	12	9.2
Pharmacist-Initiated	7	5.4
Information Seeking After Initial Dispensing		
Yes	87	66.9
No	43	33.1
Post-Dispensing Source of Information		
MD	0	0.0
Nurse	0	0.0
Pharmacist	1	0.8
Family Member or Friend	15	11.5
Drug Information Provided by Pharmacy	68	52.3
Internet	15	11.5
Patient-Provided Drug Reference	4	3.1
Commercial/ Advertising	1	0.8

Table 4.23. Participants' Medication Information Management Behaviors (MIMB) at Month One (N=130)

	n	%
Information Exchanged During Refill Dispensing		
Yes	31	24.6
No	95	75.4
Type of Counseling		
Patient-Initiated	30	23.8
Pharmacist-Initiated	1	0.8
Information Exchanged after Refill Dispensing		
Yes	24	19.0
No	102	81.0
Post-Dispensing Source of Information		
MD	7	5.6
Nurse	0	0.0
Pharmacist	2	1.6
Family Member or Friend	2	1.6
Drug Information Provided by Pharmacy	13	10.3
Internet	3	2.4
Patient-Provided Drug Reference	0	0.0
Commercial/ Advertising	0	0.0

.

Table 4.24. Participants' Medication Knowledge at Baseline (N=132)

	Percentage Agreement	Incorrect Answer n (%)		No Answer n (%)		Incomplete Answer n (%)		Correct Answer n (%)	
		Scorer 1	Scorer 2	Scorer 1	Scorer 2	Scorer 1	Scorer 2	Scorer 1	Scorer 2
Indication	84.9%	17 (12.9)	17 (12.9)	13 (9.8)	11 (8.3)	19 (14.4)	12 (9.1)	83 (62.9)	92 (69.7)
Effectiveness-Descriptive	78.8%	12 (9.1)	8 (6.1)	56 (42.4)	55 (42.0)	22 (16.7)	17 (13.0)	42 (31.8)	51 (38.9)
Effectiveness- Timing	79.6%	16 (12.1)	28 (21.2)	77 (58.3)	71 (53.8)	11 (8.4)	12 (9.1)	28 (21.2)	21 (15.9)
Medication Name	97.7%	3 (2.3)	3 (2.3)	41 (31.0)	42 (31.8)	12 (9.1)	12 (9.1)	76 (57.6)	75 (56.8)
Duration of Treatment	88.6%	3 (2.3)	7 (5.3)	84 (63.6)	81 (61.4)	12 (9.1)	7 (5.3)	33 (25.0)	37 (28.0)
Usage Instructions	88.6%	19 (14.4)	24 (18.2)	13 (9.9)	13 (9.8)	2 (1.5)	3 (2.3)	98 (74.2)	92 (69.7)
Frequency- Timing	85.6%	24 (18.2)	24 (18.2)	15 (11.4)	16 (12.1)	6 (4.5)	9 (6.8)	87 (65.9)	83 (62.9)
Frequency- Meals	92.4%	8 (6.0)	9 (6.8)	27 (20.5)	29 (22.0)	59 (44.7)	52 (39.4)	38 (28.8)	42 (31.8)
Side Effects- Descriptive	86.4%	19 (14.4)	23 (17.4)	86 (65.2)	78 (59.1)	2 (1.5)	3 (2.3)	25 (18.9)	28 (21.2)
Side Effects- Response	93.2%	2 (1.5)	5 (3.8)	107 (81.1)	103 (78.0)	13 (9.8)	14 (10.6)	10 (7.6)	10 (7.6)
Contraindications/ Precautions/ Warnings	78.0%	48 (36.4)	49 (37.1)	44 (33.3)	38 (28.8)	2 (1.5)	2 (1.5)	38 (28.8)	43 (32.6)
Interactions	87.1%	10 (7.6)	5 (3.8)	52 (39.4)	56 (42.4)	0 (0.0)	2 (1.5)	70 (53.0)	69 (52.3)
Storage	90.9%	3 (2.3)	3 (2.3)	6 (4.5)	10 (7.6)	108 (81.8)	106 (80.3)	15 (11.4)	13 (9.8)

Table 4.25. Participants' Medication Knowledge at Month One (N=126)

	Percentage Agreement	Incorrect Answer N (%)		No Answer N (%)		Incomplete Answer N (%)		Correct Answer N (%)	
		Scorer 1	Scorer 2	Scorer 1	Scorer 2	Scorer 1	Scorer 2	Scorer 1	Scorer 2
Indication	87.2%	15 (12.2)	10 (8.0)	15 (12.2)	15 (12.0)	11 (8.9)	13 (10.4)	82 (66.7)	87 (69.6)
Effectiveness-Descriptive	88.0%	10 (8.0)	9 (7.2)	53 (42.4)	53 (42.4)	5 (4.0)	6 (4.8)	57 (45.6)	57 (45.6)
Effectiveness- Timing	85.6%	15 (12.1)	11 (8.8)	68 (54.8)	70 (56.0)	7 (5.7)	9 (7.2)	34 (27.4)	35 (28.0)
Medication Name	99.2%	2 (1.6)	2 (1.6)	50 (40.0)	50 (40.0)	5 (4.0)	4 (3.2)	68 (54.4)	69 (55.2)
Duration of Treatment	88.8%	3 (2.4)	2 (1.6)	80 (64.0)	77 (61.6)	14 (11.2)	9 (7.2)	28 (22.4)	37 (29.6)
Usage Instructions	96.0%	18 (14.4)	18 (14.4)	16 (12.8)	16 (12.8)	0 (0.0)	3 (2.4)	91 (72.8)	88 (70.4)
Frequency- Timing	86.4%	17 (13.6)	23 (18.4)	13 (10.4)	15 (12.0)	1 (0.8)	9 (7.2)	94 (75.2)	78 (62.4)
Frequency- Meals	89.6%	6 (4.8)	8 (6.4)	21 (16.8)	23 (18.4)	55 (44.0)	49 (39.2)	43 (34.4)	45 (36.0)
Side Effects- Descriptive	90.4%	13 (10.4)	15 (12.0)	82 (65.6)	81 (64.8)	0 (0.0)	1 (0.8)	30 (24.0)	28 (22.4)
Side Effects- Response	95.2%	0 (0.0)	2 (1.6)	101 (80.8)	101 (80.8)	11 (8.8)	12 (9.6)	13 (10.4)	10 (8.0)
Contraindications/ Precautions/ Warnings	88.8%	37 (29.6)	43 (34.4)	45 (36.0)	45 (36.0)	0 (0.0)	1 (0.8)	43 (34.4)	36 (28.8)
Interactions	96.0%	6 (4.8)	6 (4.8)	58 (46.4)	57 (45.6)	1 (0.8)	2 (1.6)	60 (48.0)	60 (48.0)
Storage	90.9%	2 (1.6)	3 (2.4)	3 (2.4)	7 (5.6)	108 (86.4)	103 (82.4)	12 (9.6)	12 (9.6)

Table 4.26. Changes in Participants' Medication Knowledge Between Baseline and Month One

		Baseline Mean		Month One Mean
	N	(SD)	N	(SD)
Indication	132	1.31 (1.02)	125	1.30 (1.09)
Effectiveness-How	131	0.79 (0.95)	125	0.88 (1.03)
Effectiveness- Timing*	132	0.29 (0.84)	125	0.52 (0.92)
Name	132	1.21 (0.96)	125	1.12 (1.00)
Duration of Treatment	132	0.56 (0.89)	125	0.59 (0.88)
Usage Instructions	132	1.30 (1.11)	125	1.30 (1.14)
Timing of dose	132	1.16 (1.15)	125	1.16 (1.15)
Timing- Meals*	132	0.96 (0.86)	125	1.06 (0.81)
Side Effects- Descriptive	132	0.36 (0.90)	125	0.36 (0.90)
Side Effects- Response	132	0.23 (0.59)	125	0.27 (0.60)
Contraindications/Precautions Warnings	132	0.26 (1.10)	125	0.32 (1.14)
Interactions	132	1.00 (0.99)	125	0.92 (1.06)
Storage	132	1.00 (0.49)	125	1.02 (0.45)
Total PMK	132	0.80 (0.37)	125	0.83 (0.40)

*Statistically significant change based on paired t-test ($p<0.05$)

Medication Beliefs

Medication beliefs included four sub-scales: necessity, concern, harm, and overuse. All items were measured on a five-point Likert scale with a score of one being "strongly disagree" and five being "strongly agree." Frequencies for the BMQ are presented in Tables 4.26 and 4.27. Nearly half (45.4%) of participants strongly agreed with the statement, "Without my medicines I would be very ill." A smaller percentage of participants strongly agreed that their life would be impossible without their medicines (36.4%), their health in the future would depend on their medicine (37.1%), and that the medicines protect them from becoming worse (39.4%). Of the four questions specifically addressing the necessity of medications, the highest percentage of participants disagreed or strongly disagreed (28.0%) that their life would be impossible without their medication. These patterns remained at month one. The highest percentage of participants strongly agreed (47.6%) with the statement, "Without my medicines I would be very ill." Participants most frequently disagreed (16.7%) or strongly disagreed (8.7%) that their life would

be impossible without their medicine. Changes in mean scores for the BMQ item and subscales are presented in Table 4.28.

4.3 **Aim One Results**

The first aim of the study was to describe older adults' attitudes about medication information seeking and the relationships between those attitudes and medication information seeking behaviors. First, the descriptive statistics of issue importance are presented. Bivariate correlations are then presented for each hypothesis. Hypothesized, measurement, and structural models are presented for information management behaviors from pharmacists.

Table 4.27. Participants' Medication Beliefs at Baseline (N=130)

	Strongly Disagree n (%)	Disagree n (%)	Uncertain n (%)	Agree n (%)	Strongly Agree n (%)
Necessity Subscale	8 (6.1)	12 (9.1)	16 (12.1)	36 (27.3)	60 (45.4)
Without my medicines I would be very ill.					
My life would be impossible without my medicines.	15 (11.3)	22 (16.7)	22 (16.7)	25 (18.9)	48 (36.4)
My health in the future will depend on my medicines.	7 (5.3)	11 (8.3)	26 (19.7)	39 (29.6)	49 (37.1)
My medicines protect me from becoming worse.	4 (3.0)	13 (9.9)	12 (9.1)	51 (38.6)	52 (39.4)
Concern Subscale	40 (30.3)	32 (24.2)	22 (16.7)	17 (12.9)	21 (15.9)
I sometimes worry about becoming too dependent on my medicines.					
My medicines disrupt my life.	52 (39.4)	43 (32.6)	15 (11.4)	11 (8.3)	11 (8.3)
These medicines give me unpleasant side effects.	52 (39.4)	46 (34.9)	16 (12.1)	14 (10.6)	4 (3.0)
Harm Subscale	45 (34.1)	23 (17.4)	34 (25.8)	18 (13.6)	12 (9.1)
Medicines do more harm than good.					
All medicines are poisons.	76 (57.6)	25 (18.9)	18 (13.6)	10 (7.6)	3 (2.3)
Most medicines are addictive.	38 (28.8)	35 (26.5)	25 (18.9)	20 (15.2)	14 (10.6)
People who take medicines should stop their treatment for a while every now and again.	60 (45.5)	21 (15.9)	28 (21.2)	17 (12.9)	6 (4.5)
Overuse Subscale	31 (23.5)	28 (21.2)	37 (28.0)	24 (18.2)	12 (9.1)
Natural remedies are safer than medicines.					
Doctors use too many medicines.	27 (20.4)	29 (22.0)	34 (25.8)	19 (14.4)	23 (17.4)
If doctors had more time with patients they would prescribe fewer medicines.	26 (19.7)	24 (18.2)	44 (33.3)	22 (16.7)	16 (12.1)
Doctors place too much trust on medicines.	24 (18.2)	23 (17.4)	40 (30.3)	26 (19.7)	19 (14.4)

Table 4.28. Participants' Medication Beliefs at Month One (N=125)

	Strongly Disagree n (%)	Disagree n (%)	Uncertain n (%)	Agree n (%)	Strongly Agree n (%)
Necessity Subscale	3 (2.4)	14 (11.1)	19 (15.1)	30 (23.8)	60 (47.6)
Without my medicines I would be very ill.					
My life would be impossible without my medicines.	11 (8.7)	21 (16.7)	20 (15.9)	28 (22.2)	46 (36.5)
My health in the future will depend on my medicines.	7 (5.5)	13 (10.3)	20 (15.9)	39 (31.0)	47 (37.3)
My medicines protect me from becoming worse.	4 (3.2)	10 (7.9)	13 (10.3)	47 (37.3)	52 (41.3)
Concern Subscale	34 (27.0)	33 (26.2)	25 (19.8)	19 (15.1)	15 (11.9)
I sometimes worry about becoming too dependent on my medicines.					
My medicines disrupt my life.	48 (38.1)	34 (27.0)	19 (15.1)	14 (11.1)	11 (8.7)
These medicines give me unpleasant side effects.	49 (38.9)	40 (31.7)	20 (15.9)	14 (11.1)	3 (2.4)
Harm Subscale	47 (37.6)	22 (17.6)	29 (23.2)	19 (15.2)	8 (6.4)
Medicines do more harm than good.					
All medicines are poisons.	68 (54.0)	27 (21.4)	15 (11.9)	13 (10.3)	3 (2.4)
Most medicines are addictive.	36 (28.6)	35 (27.8)	24 (19.0)	24 (19.0)	7 (5.6)
People who take medicines should stop their treatment for a while every now and again.	54 (42.9)	26 (20.6)	23 (18.3)	15 (11.9)	8 (6.3)
Overuse Subscale	30 (23.8)	28 (22.2)	33 (26.2)	25 (19.9)	10 (7.9)
Natural remedies are safer than medicines.					
Doctors use too many medicines.	21 (16.6)	28 (22.2)	37 (29.4)	23 (18.3)	17 (13.5)
If doctors had more time with patients they would prescribe fewer medicines.	22 (17.5)	24 (19.0)	39 (31.0)	29 (23.0)	12 (9.5)
Doctors place too much trust on medicines.	20 (15.9)	21 (16.6)	34 (27.0)	33 (26.2)	18 (14.3)

Table 4.29. Changes in Participants' Medication Beliefs Between Baseline and Month One

	N	Baseline Mean (SD)	N	Month 1 Mean (SD)
Without my medicines I would be very ill.	132	3.97 (1.22)	126	4.03 (1.14)
My life would be impossible without my medicines.*	132	3.52 (1.42)	126	3.61 (1.36)
My health in the future will depend on my medicines.	132	3.85 (1.17)	126	3.84 (1.20)
My medicines protect me from becoming worse.	132	4.02 (1.08)	126	4.06 (1.06)
Necessity Subscale Total Score		15.36 (4.12)		15.53 (3.99)
[Per Item Mean Score]		[3.84 (1.03)]		[3.88 (1.00)]
I sometimes worry about becoming too dependent on my medicines.	132	2.60 (1.44)	126	2.59 (1.35)
My medicines disrupt my life.	132	2.14 (1.26)	126	2.25 (1.31)
These medicines give me unpleasant side effects.	132	2.03 (1.11)	126	2.06 (1.10)
Concern Subscale Total Score		6.77 (3.00)		6.90 (2.89)
[Per Item Mean Score]		[2.26 (1.00)]		[2.30 (0.96)]
Medicines do more harm than good.	132	2.46 (1.33)	125	2.35 (1.30)
All medicines are poisons.	132	1.78 (1.09)	126	1.86 (1.13)
Most medicines are addictive.	132	2.52 (1.33)	126	2.45 (1.24)
People who take medicines should stop their treatment for a while every now and again.	132	2.15 (1.26)	126	2.18 (1.28)
Harm Subscale Total Score		8.92 (3.87)		8.83 (3.75)
[Per Item Mean Score]		[2.23 (0.97)]		[2.21 (0.94)]
Natural remedies are safer than medicines.	132	2.68 (1.27)	126	2.66 (1.26)
Doctors use too many medicines.	132	2.86 (1.37)	126	2.90 (1.27)
If doctors had more time with patients they would prescribe fewer medicines.	132	2.83 (1.27)	126	2.88 (1.22)
Doctors place too much trust on medicines	132	2.95 (1.30)	126	3.06 (1.28)
Overuse Subscale Total Score		11.33 (4.22)		11.50 (4.22)
[Per Item Mean Score]		[2.83 (1.06)]		[2.88 (1.05)]

*Statistically significant change based on paired t-test ($p<0.05$)

4.3.1 Issue Importance

Information importance is measured as a single item and is considered a "scope condition" of utilizing the TMIM. For the TMIM to be valid in a new context, a majority of the sample must agree that the topic that is the focus of the information seeking is important. In this sample, a majority of participants strongly agreed that it is important that they know about their medications (71.5%), while less than 3% somewhat disagreed (0.8%), disagreed (0.0%), or strongly disagreed (1.5%). Results validate the TMIM as a potentially useful theory to explore in this context.

4.3.2 Bivariate Results

All variables utilized in the analysis for aim one were measured using a seven-point Likert scales. Non-parametric tests were utilized based on previously presented normality results. Spearman's correlations were utilized to explore relationships between potential variables in the structural equation models. Spearman's correlations for potential variables in the model are presented in Table 4.29.

Analyses for Hypothesis 1.1

Hypothesis 1.1 was to examine if uncertainty discrepancy would be positively correlated with active medication information-seeking behaviors and negatively correlated with avoidance. In bivariate correlations, uncertainty discrepancy was not statistically significantly related to information seeking (Spearman's correlation=0.108, p=0.230) or information avoidance (Spearman's correlation= 0.007, p=0.935). Hypothesis one was not supported in bivariate analysis.

Analyses for Hypothesis 1.2

Hypothesis 1.2 was to examine if the magnitude of older adults' uncertainty discrepancy would be positively correlated with anxiety about that perceived uncertainty.

Table 4.30. Spearman Correlation Matrix and P-Values for Attitudes about Information Seeking

		UD[a]	A[b]	OA+[c]	OA-[d]	CME[e]	CPE[f]	TEA[g]	TEH[h]	SP[i]	AP[j]
UD[a]	Spearman Coefficient		0.350**	0.036	0.004	-0.260**	-0.163	-0.119	-0.059	0.108	0.007
	Sig. (2-tailed)		0.000	0.695	0.968	0.004	0.070	0.189	0.518	0.230	0.935
	N		124	124	124	124	124	124	124	124	124
A[b]	Spearman Coefficient	0.350**		-0.079	0.216*	-0.306**	-0.298**	-0.151	-0.091	-0.112	0.214*
	Sig. (2-tailed)	0.000		0.383	0.016	0.001	0.001	0.094	0.313	0.217	0.017
	N	124		124	124	124	124	124	124	124	124
OA+[c]	Spearman Coefficient	0.036	-0.079		0.230*	0.205*	0.134	0.126	0.437**	0.434**	-0.003
	Sig. (2-tailed)	0.695	0.383		0.010	0.023	0.137	0.163	0.000	0.000	0.977
	N	124	124		124	124	124	124	124	124	124
OA-[d]	Spearman Coefficient	0.004	0.216*	0.230*		-0.006	0.116	-0.005	0.039	-0.066	0.073
	Sig. (2-tailed)	0.968	0.016	0.010		0.949	0.201	0.957	0.665	0.469	0.418
	N	124	124	124		124	124	124	124	124	124
CME[e]	Spearman Coefficient	-0.260**	-0.306**	0.205*	-0.006		0.210*	0.445**	0.359**	0.031	-0.086
	Sig. (2-tailed)	0.004	0.001	0.023	0.949		0.019	0.000	0.000	0.729	0.341
	N	124	124	124	124		124	124	124	124	124
CPE[f]	Spearman Coefficient	-0.163	-0.298**	0.134	0.116	0.210*		0.107	0.011	-0.027	-0.388**
	Sig. (2-tailed)	0.070	0.001	0.137	0.201	0.019		0.238	0.905	0.766	0.000
	N	124	124	124	124	124		124	124	124	124
TEA[g]	Spearman Coefficient	-0.119	-0.151	0.126	-0.005	0.445**	0.107		0.588**	0.130	-0.037
	Sig. (2-tailed)	0.189	0.094	0.163	0.957	0.000	0.238		0.000	0.151	0.680
	N	124	124	124	124	124	124		124	124	124
TEH[h]	Spearman Coefficient	-0.059	-0.091	0.437**	0.039	0.359**	0.011	0.588**		0.329**	-0.107
	Sig. (2-tailed)	0.518	0.313	0.000	0.665	0.000	0.905	0.000		0.000	0.237
	N	124	124	124	124	124	124	124		124	124
IS-P[i]	Spearman Coefficient	0.108	-0.112	0.434**	-0.066	0.031	-0.027	0.130	0.329**		0.050
	Sig. (2-tailed)	0.230	0.217	0.000	0.469	0.729	0.766	0.151	0.000		0.583
	N	124	124	124	124	124	124	124	124		124

Table 4.30 continued

		UDa	Ab	OA+c	OA-d	CMEe	CPEf	TEAg	TEHh	SPi	APj
IA-P[j]	Spearman Coefficient	0.007	0.214*	-0.003	0.073	-0.086	-0.388**	-0.037	-0.107	0.050	
	Sig. (2-tailed)	0.935	0.017	0.977	0.418	0.341	0.000	0.680	0.237	0.583	
	N	124	124	124	124	124	124	124	124	124	

**p< 0.01 (2-tailed)

*p<0.05 (2-tailed)

[a]UD= Uncertainty Discrepancy

[b]A= Anxiety

[c]OA+= Positive Outcome Assessments

[d]OA-= Negative Outcome Assessments

[e]CME= Communication Efficacy

[f]CPE= Coping Efficacy

[g]TEA= Target Efficacy- Honesty

[h]TEH= Target Efficacy Ability

[i]IS-P= Information Seeking- Pharmacist

[j]IA-P= Information Avoidance- Pharmacist

Uncertainty discrepancy was positively correlated with anxiety (Spearman's correlation=0.350, p<0.001). Hypothesis two was supported in bivariate correlations.

Analyses for Hypothesis 1.3

Hypothesis 1.3 was to examine if the intensity of older adults' anxiety concerning their uncertainty about medications would be negatively correlated with their outcome and efficacy assessments. Anxiety was negatively correlated with negative outcome expectations (Spearman's correlation=-0.216, p=0.016), communication efficacy (Spearman's correlation=-0.306, p=0.001), and coping efficacy (Spearman's correlation=-0.298, p=0.001). As anxiety increased in this sample, participants' perceptions of their own ability to communicate and cope with the information seeking process were diminished. Participants were also more likely to have negative perceptions of the outcomes of information seeking (negative correlation, but negative outcome assessments were reverse coded) as anxiety increased. Anxiety was not significantly related to target efficacy or positive outcome assessments. Hypothesis three was partially supported in bivariate analysis.

Analyses for Hypothesis 1.4

Hypothesis 1.4 was to examine if a linear combination of outcome assessments and coping efficacy would be positively correlated with active medication information-seeking, and negatively correlated with avoidance. Looking at individual predictors, only positive outcome assessments were positively correlated with information seeking from a pharmacist (Spearman's correlation=0.434, p<0.001), and only coping efficacy was negatively correlated with information avoidance from a pharmacist (Spearman's correlation=-0.388, p<0.001). Negative outcome assessments were not correlated with information seeking or avoidance. Participants' with higher expectations about the positive outcomes of information seeking were more likely to ask a pharmacist questions about their medications. Participants with less self-efficacy in their ability to cope with the negative outcomes of information seeking were more likely to avoid asking a pharmacist questions about their medication. The linear combination could not be tested in bivariate analyses and was analyzed in multivariate analysis as a single, higher order factor in the measurement model.

Analyses for Hypothesis 1.5

Hypotheses 1.5 was to examine if a linear combination of communication efficacy and target efficacy would be positively correlated with active medication information-seeking and negatively correlated with avoidance. Looking at individual predictors, target efficacy (honesty) was positively correlated with information seeking (Spearman's correlation=0.329, $p<0.001$). Communication efficacy and target efficacy (ability) were not related to information seeking or avoidance. The linear combination could not be tested in bivariate analyses and was analyzed in multivariate analysis as a single, higher order factor in the measurement model.

Analyses for Hypothesis 1.6

Hypothesis 1.6 was to examine if outcome assessments would be positively correlated with efficacy assessments. Positive outcome assessments were positively correlated with communication efficacy (Spearman's correlation=0.205, $p=0.023$) and target efficacy (honesty) (Spearman's correlation=0.437, $p<0.001$). Negative outcome assessments were not correlated with any efficacy assessments. Participants with higher expectations about the positive outcomes of information seeking also had higher self-efficacy for communicating with pharmacists and more positive perceptions of pharmacists' availability. Hypothesis six was partially supported in bivariate analysis.

Analyses for Hypothesis 1.7

Hypothesis 1.7 was to examine if efficacy assessments (communication efficacy, coping efficacy, and target efficacy) would mediate the association between anxiety about uncertainty discrepancy and medication information-seeking behaviors. Anxiety was directly correlated with information avoidance (Spearman's correlation=0.214, $p=0.017$), but not with information seeking. The indirect effect of anxiety on information seeking behaviors could not be tested in bivariate analyses and behaviors and the medication effect will be tested in multivariate analysis.

4.3.3 Multivariate Results

The hypothesized model (see Figure 4.2) includes a combination of latent and measured variables, therefore multivariate analysis was performed in two steps. First, a confirmatory factor

analysis was performed for outcome and efficacy assessments in measurement models. After the measurement models were identified, the full structural model was analyzed. Due to the overall complexity of the model and the moderate sample size, individual items were dropped from the structural model if measurement models proved to have good fit. Models were considered to have good fit if the Bollen-Stein bootstrap >0.05, Root Mean Square Error of Approximation (RMSEA) <0.85, Comparative Fit Index (CFI) >0.90, and Standardized Root Mean Square Residual (SRMR <0.08) (Klein, 2005). All variables in the structural models were treated as measured variables. All models have error terms removed for the sake of clarity, and parameter specification for all models is listed in Table 4.30.

The potential measurement models for pharmacist efficacy assessments are shown in Figures 4.3 and 4.4. Although all individual items loaded onto constructs with values greater than 0.5 in model one, the overall model fit was poor (see Table 4.31).

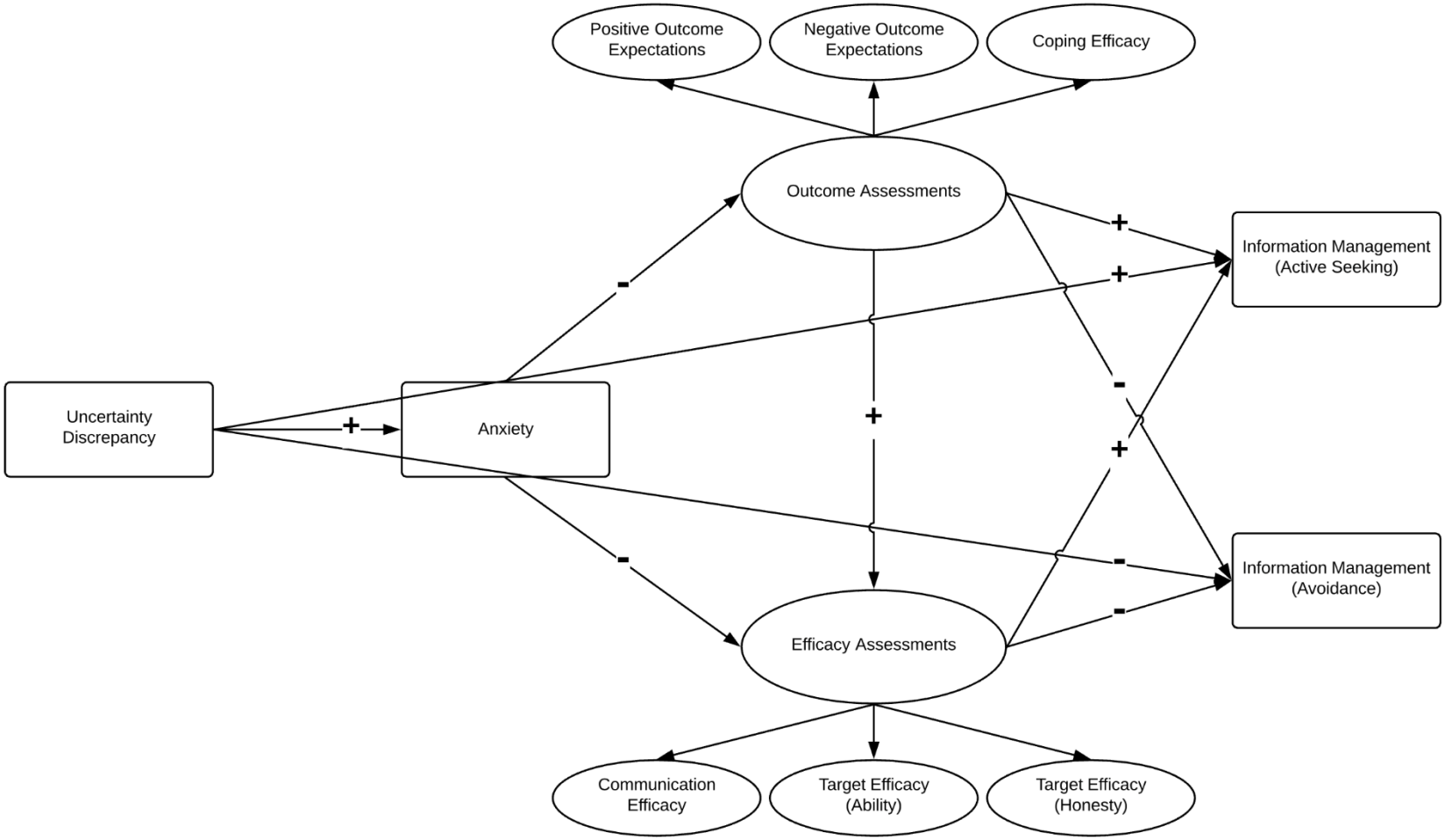


Figure 4.2. Hypothesized Model: Information Management Behaviors in the Community Pharmacy Context

Table 4.31. Parameter Specification for Measurement and Structural Models		
Communication Efficacy	CM1	I know what to say to get information about my medications from a pharmacist.
	CM2	I know what questions to ask a pharmacist about my medications.
	CM3	I am confident I can approach a pharmacist to talk about my medications.
Target efficacy (ability)	TA1	A pharmacist can provide me the information I want about my medications.
	TA2	A pharmacist has complete information about medications.
Target efficacy (honesty)	TH1	A pharmacist would be completely honest about my medications.
	TH2	A pharmacist is available to talk to me about my medications.
	TH3	A pharmacist wants to talk to me about my medications.
	TH4	A pharmacist has the time to talk to me about my medications.
Positive Outcome Expectancies	POE1	If I ask a pharmacist questions about my medications, I will get more benefit from my medication.
	POE2	If I ask a pharmacist questions about my medications, I will know more about my medicine.
	POE3	If I ask a pharmacist questions about my medications, my confidence in managing my medication will increase.
	POE4	If I ask a pharmacist questions about my medications, my chances of having problems with the medicine will decrease.
	POE5	If I ask a pharmacist questions about my medications, it will be easier to take my medicine correctly.
Negative Outcome Expectancies	NOE1	If I ask a pharmacist questions about my medications, it will remind me I'm sick or unwell.
	NOE2	If I ask a pharmacist questions about my medications, others that are waiting will get upset.
	NOE3	If I ask a pharmacist questions about my medications, I will appear uneducated.
	NOE4	If I ask a pharmacist questions about my medications, the information will be overwhelming.
	NOE5	If I ask a pharmacist questions about my medications, I will have to spend more time in the doctor's office or pharmacist.

Table 4.31 continued

Coping Efficacy	CP1	If the information you get is overwhelming, how able to cope with this situation are you?
	CP2	If you are reminded that you are sick or unwell, how able to cope with this situation are you?
	CP3	If you look uneducated, how able to cope with this situation are you?
	CP4	If other patients that are waiting get upset, how able to cope with this situation are you?
	CP5	If you have to spend a longer amount of time in the pharmacy, how able to cope with this situation are you?

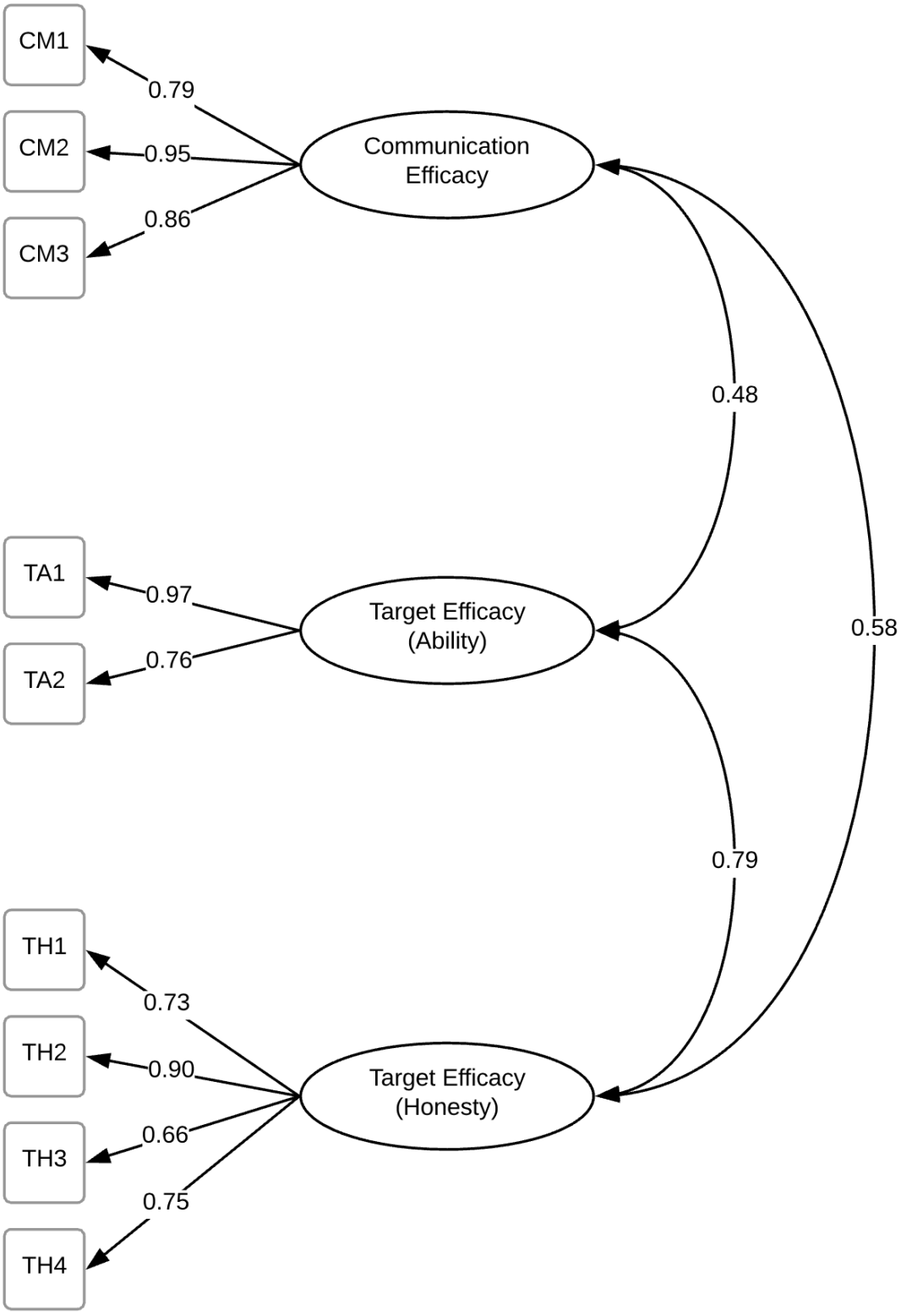


Figure 4.3. Measurement Model One for Pharmacist Efficacy

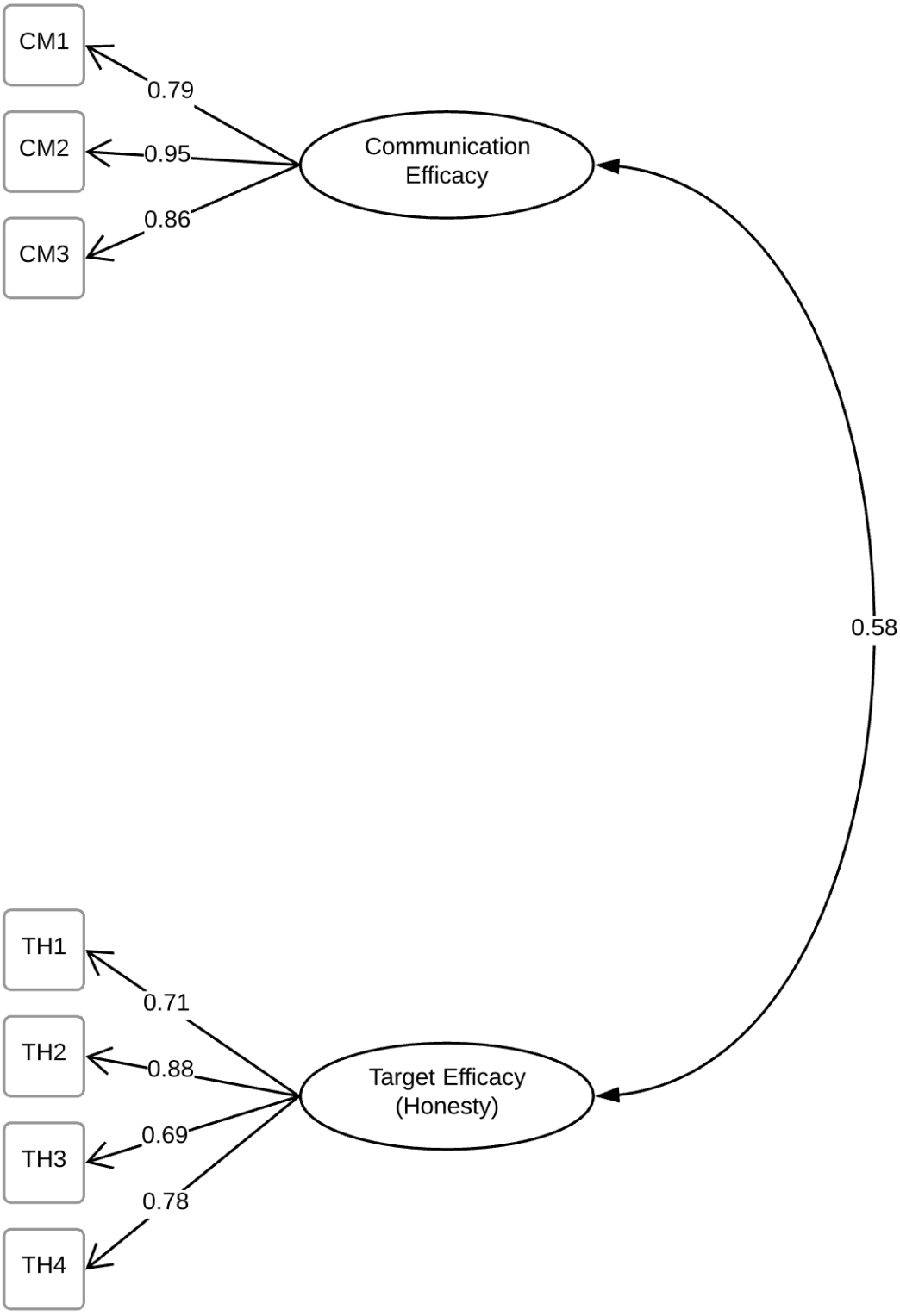


Figure 4.4. Measurement Model Two for Pharmacist Efficacy

Table 4.32. Fit Statistics for Maximum Likelihood Estimation of Efficacy Measurement Models

	Model One	Model Two
X^2	67.546	23.502
DF	24	13
$Pr > X^2$	2.814	1.808
Bollen-Stine bootstrap	0.020	0.261
RMSEA	0.121	0.081
PCLOSE	0.001	0.154
TLI	0.908	0.966
CFI	0.939	0.979
SRMR	0.0425	0.0381

Unstandardized and standardized estimates for Model One are presented in Table 4.32. Target efficacy (ability) was removed from the model, and the final measurement model is presented in Figure 4.4. The overall model fit was good (see Table 4.31), and all item loadings were significant (see Table 4.33).

The potential measurement models for pharmacist outcome assessments are shown in Figures 4.5 and 4.6. The overall model fit for model one was poor (see Table 4.34), and several individual items had low factor loading estimates (see Table 4.35). Low factor loading scores were removed so that there were no overlapping scenarios between negative outcome assessments and coping efficacy (see Figure 4.6). Model fit was good (see Table 4.34) and all estimated loaded significantly onto the constructs (see Table 4.36).

According to the hypotheses, a higher order latent factor for efficacy and outcome assessments were attempted, however the model for efficacy was just-identified and so model fit estimates were not able to be produced (see Figure 4.7). The measurement model for pharmacist outcomes was unidentified (see Figure 4.8). Based on these results the individual constructs were left in the final structural model for pharmacists (see Figure 4.9). Individual constructs have been utilized in a majority of past studies when a higher order factor could not be identified. The overall fit for the structural model was good (see Table 4.37), and unstandardized and standardized estimates are presented in Table 4.38.

Table 4.33. Parameter Estimates for Efficacy Measurement Model One

	Unstandardized Estimates	Standardized Estimates	SE	CR
CME1 ← CME	1.000	0.793		
CME2 ← CME	1.036	0.951	0.087	11.897
CME3 ← CME	0.878	0.859	0.081	10.796
TEA1 ← TEA	1.000	0.974		
TEA2 ← TEA	0.984	0.760	0.107	9.205
TEH1 ← TEH	1.000	0.726		
TEH2 ← TEH	1.253	0.901	0.136	9.210
TEH3 ← TEH	1.017	0.664	0.144	7.077
TEH4 ← TEH	1.267	0.751	0.159	7.976

CME=Communication efficacy

TEA= Target efficacy- ability

THH= Target efficacy- honesty

Table 4.34. Parameter Estimates for Efficacy Measurement Model Two

	Unstandardized Estimates	Standardized Estimates	SE	CR
CME1 ← CME	1.000	0.792		
CME2 ← CME	1.041	0.955	0.088	11.847
CME3 ← CME	0.875	0.855	0.081	10.767
TEH1 ← TEH	1.000	0.706		
TEH2 ← TEH	1.264	0.885	0.147	8.613
TEH3 ← TEH	1.084	0.690	0.154	7.040
TEH4 ← TEH	1.343	0.775	0.172	7.801

CME=Communication efficacy

THH= Target efficacy- honesty

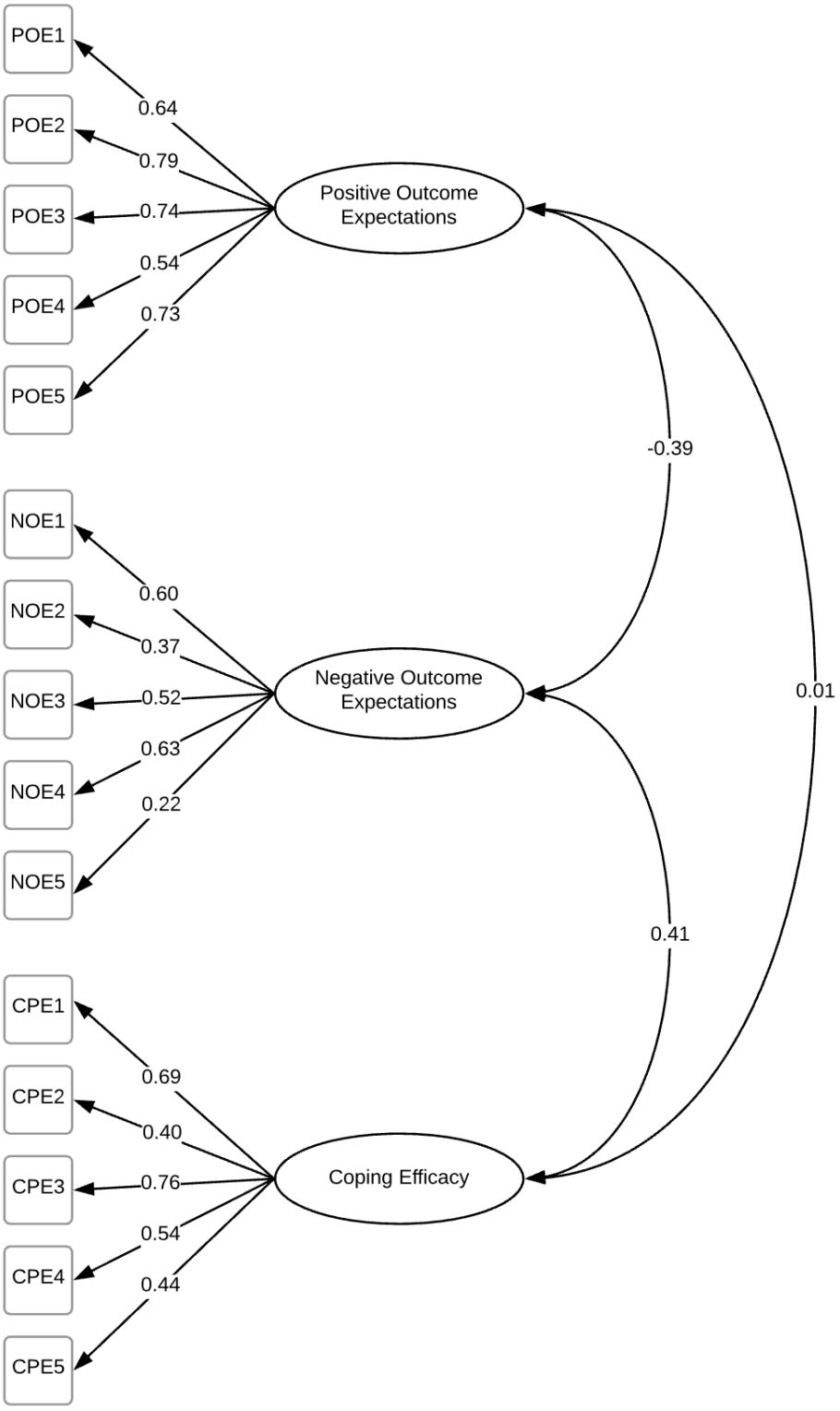


Figure 4.5. Measurement Model One for Pharmacist Outcomes

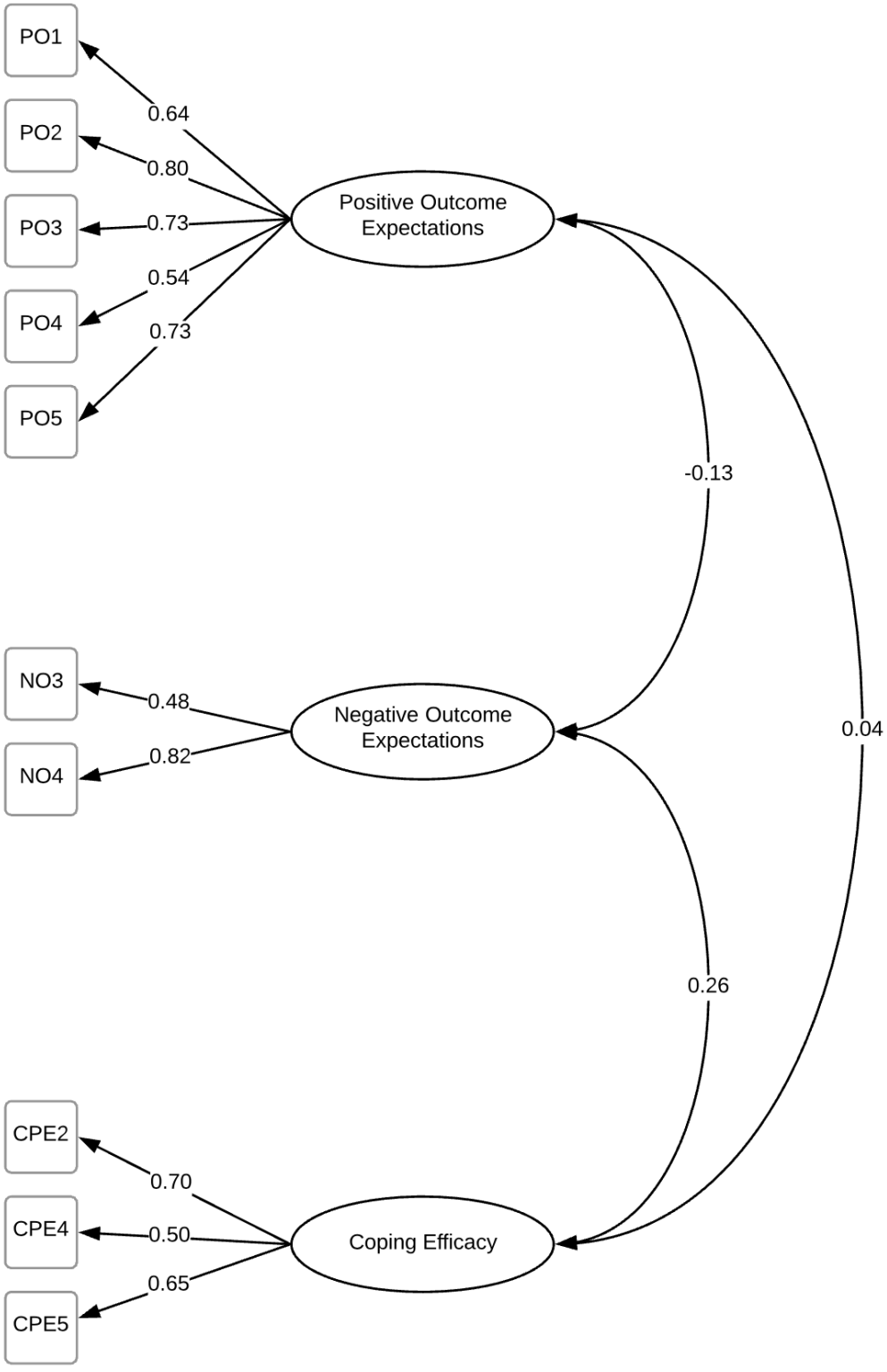


Figure 4.6. Measurement Model Two for Pharmacist Outcomes

Table 4.35. Fit Statistics for Maximum Likelihood Estimation of Outcome Measurement Models

	Model 1	Model 2
X^2	226.417	35.545
DF	87	32
$Pr > X^2$	2.602	1.111
Bollen-Stine bootstrap	0.002	0.645
RMSEA	0.114	0.030
PCLOSE	0.000	0.716
TLI	0.660	0.981
CFI	0.718	0.987
SRMR	0.1130	0.0589

Table 4.36. Parameter Estimates for Outcomes Measurement Model One

	Unstandardized Estimates	Standardized Estimates	SE	CR
POE1 ← POE	1.167	0.736	0.185	6.310
POE2 ← POE	1.037	0.541	0.206	5.044
POE3 ← POE	1.191	0.728	0.183	6.506
POE4 ← POE	1.080	0.795	0.162	6.666
POE5 ← POE	1.000	0.641		
NOE1 ← NOE	1.000	0.599		
NOE2 ← NOE	0.636	0.375	0.232	2.742
NOE3 ← NOE	0.863	0.520	0.325	2.652
NOE4 ← NOE	0.933	0.631	0.305	3.058
NOE5 ← NOE	0.391	0.219	0.223	1.754
CPE1 ← CPE	1.710	0.693	0.537	3.186
CPE2 ← CPE	1.000	0.395		
CPE3 ← CPE	1.988	0.755	0.641	3.099
CPE4 ← CPE	1.350	0.541	0.396	3.410
CPE5 ← CPE	1.044	0.443	0.319	3.269

POE=Positive Outcome Expectancies

NOE=Negative Outcome Expectancies

CPE=Coping Efficacy

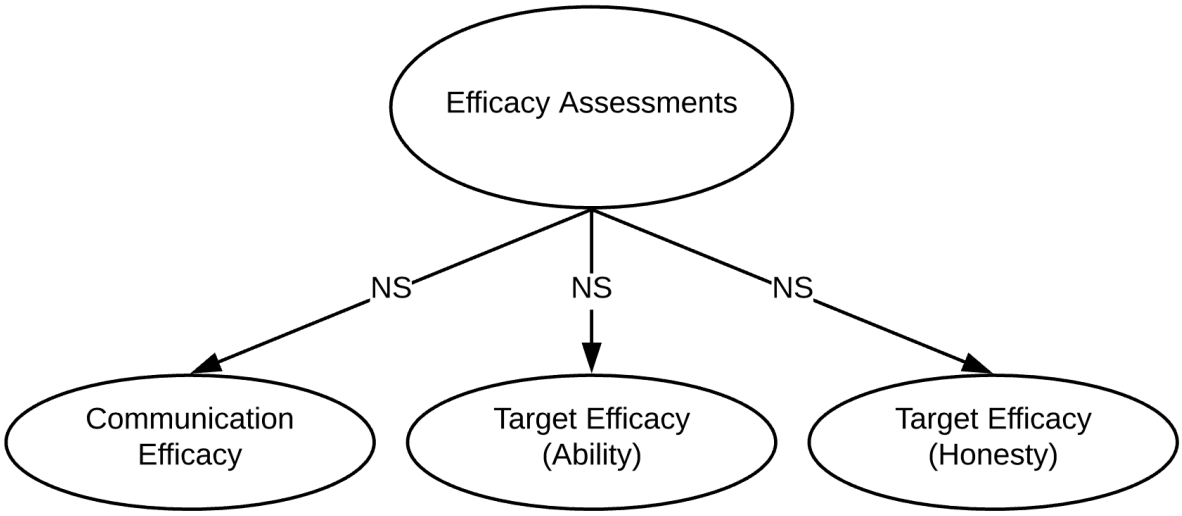
Table 4.37. Parameter Estimates for Outcomes Measurement Model Two

	Unstandardized Estimates	Standardized Estimates	SE	CR
POE1 ← POE	1.172	0.735	0.187	6.255
POE2 ← POE	1.042	0.540	0.208	5.013
POE3 ← POE	1.203	0.731	0.186	6.481
POE4 ← POE	1.090	0.797	0.165	6.614
POE5 ← POE	1.000	0.636		
NOE3 ← NOE	1.000	0.481		
NOE4 ← NOE	1.523	0.821	1.101	1.383
CPE2 ← CPE	1.000	0.701		
CPE4 ← CPE	0.707	0.503	0.190	3.714
CPE5 ← CPE	0.866	0.652	0.229	3.789

POE=Positive Outcome Expectancies

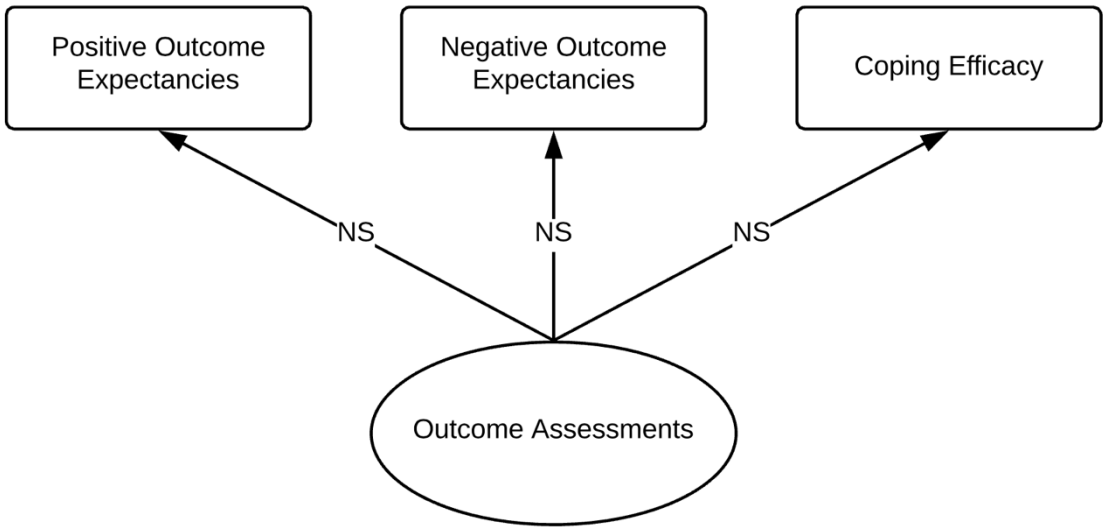
NOE=Negative Outcome Expectancies

CPE=Coping Efficacy



NS=Not specified

Figure 4.7. Higher Order Factor Measurement Model for Efficacy Assessments



*NS=Not specified

Figure 4.8. Higher Order Factor Measurement Model for Efficacy Assessments

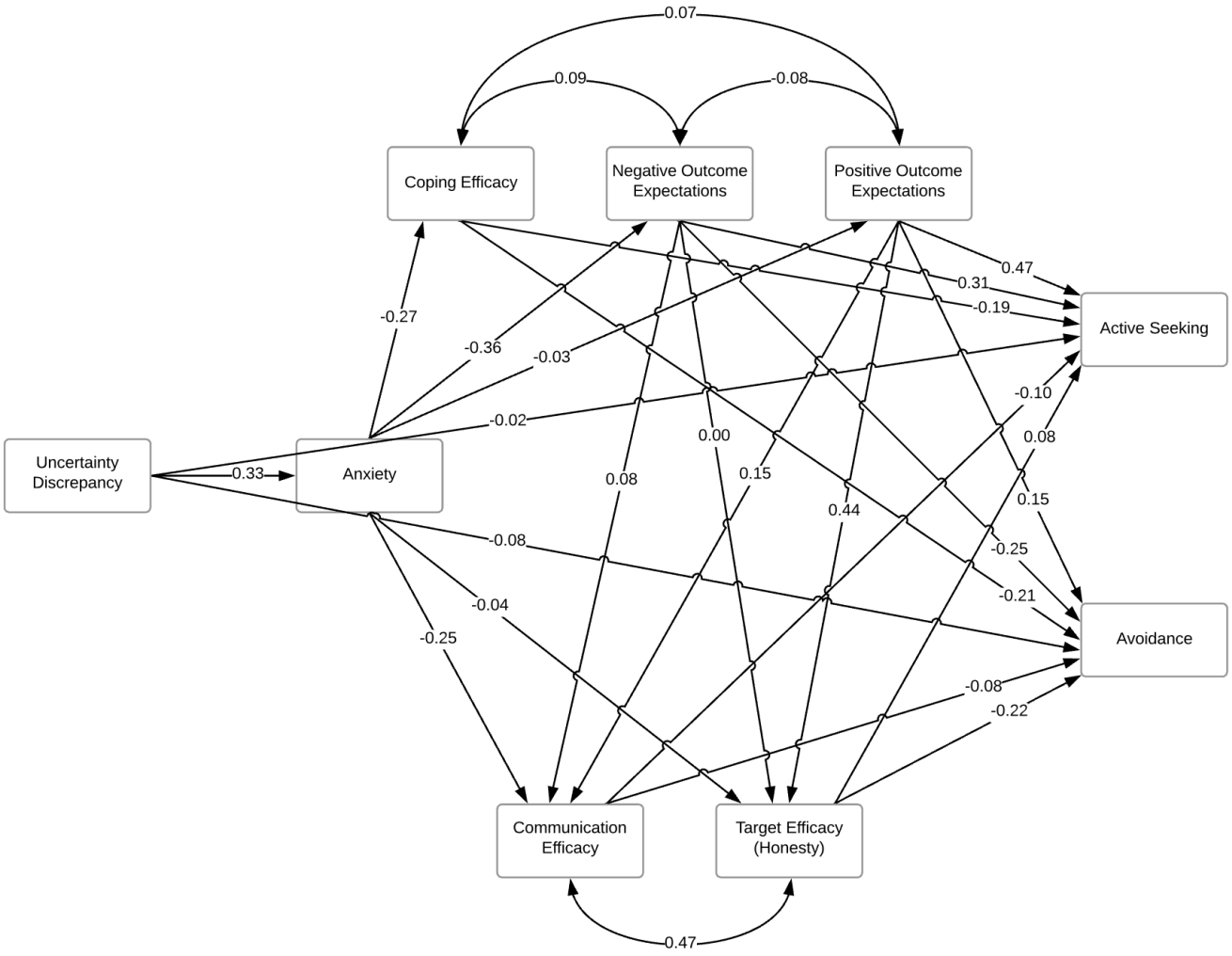


Figure 4.9. Structural Model: Information Management Behaviors in the Community Pharmacy Context

Table 4.38. Fit Statistics for Maximum Likelihood Estimation of Structural Model of Information Seeking Behaviors in the Community Pharmacy Context

X^2	18.745
DF	10
$Pr > X^2$	1.875
Bollen-Stine bootstrap	0.269
RMSEA	0.084
PCLOSE	0.154
TLI	0.818
CFI	0.949
SRMR	0.0505

Table 4.39. Parameter Estimates for Structural Model

	Unstandardized Estimates	Standardized Estimates	SE	CR
A ← UD*	0.345	0.329	0.089	3.863
NOE ← A*	-0.305	-0.358	0.072	-4.256
POE ← A	-0.021	-0.031	0.062	-0.338
TEH ← A	-0.031	-0.045	0.061	-0.516
CME ← POE	0.179	0.148	0.104	1.729
TEH ← POE*	0.446	0.440	0.082	5.426
CME ← A*	-0.213	-0.254	0.077	-2.783
CPE ← A*	-0.218	-0.267	0.071	-3.067
CME ← NOE	0.079	0.080	0.090	0.873
TEH ← NOE	0.002	0.002	0.071	0.022
IA ← POE	0.212	0.153	0.126	1.678
IS ← UD	-0.015	-0.017	0.069	-0.213
IA ← UD	-0.078	-0.078	0.087	-0.893
IS ← POE*	0.561	0.472	0.099	5.641
IA ← NOE*	-0.280	-0.250	0.093	-3.000
IS ← NOE*	0.303	0.315	0.074	4.115
IS ← CPE*	-0.187	-0.187	0.077	-2.444
IA ← CPE*	-0.249	-0.213	0.097	-2.562

Table 4.39. continued

	Unstandardized Estimates	Standardized Estimates	SE	CR
IA ← THE*	-0.298	-0.218	0.139	-2.146
IS ← TEH	0.092	0.079	0.109	0.840
IA ← CME	-0.097	-0.085	0.114	-0.850
IS ← CME	-0.101	-0.103	0.090	-1.126

*p<0.05

4.4 Aim Two Results

The second aim of the study was to characterize the relationship between medication outcomes and medication information seeking behaviors (MIMB) during refill dispensing. Analyses for hypotheses one and two are to compare information seeking during refill dispensing to medication knowledge. Analyses for hypotheses three is to compare information seeking during refill dispensing to medication beliefs, and analyses for hypotheses four is to compare information seeking at refill dispensing to attitudes towards medication information seeking.

4.4.1 Medication Information Seeking

Information seeking during refill dispensing was a dichotomous variable comparing participants' that reported information seeking during refill dispensing (n=30) to those that reported no information seeking during refill dispensing (n=96). Information seeking was defined as those who answered "yes" to the question "Did you talk to any pharmacy staff about your new medication when you picked it up?" and reported that they initiated the conversation when asked, "If spoke with a pharmacist, who started the conversation? Did you ask to speak to the pharmacist or did the pharmacist approach you to speak to you without you asking?" Those that reported that information exchange was initiated by a pharmacist (n=1) were excluded from the analysis because it cannot be determined if those approached by a pharmacist would have initiated information seeking on their own without the pharmacist initiating the conversation.

The study was also specifically designed to increase variability in participants' information seeking behavior by randomizing half of the sample (n=62) to receive a brief one-page education tool and a card with specific questions to ask the pharmacist during refill dispensing (see Appendix B). At month one, a fidelity check of the intervention was completed by asking participants about their interactions with pharmacy staff during refill dispensing. Some participants that were asked to seek information from a pharmacist, did not report actually seeking information at refill dispensing. In addition, some participants that were not specifically randomized to seek information from a pharmacist sought information on their own initiative. This produced four potential groups of patients: those randomized to information seeking could either be "compliers" or "defiers" of the intervention and those randomized to no intervention could either be "always seekers" or "never seekers." The highest percentage of participants (44.4%) were not randomized

to information seeking and did not seek information on their own, while the smallest percentage of participants did not get randomized to information seeking and sought information on their own (6.3%) (see Table 4.39). Principal stratification was initially planned as the methodology for accounting for the differences in these groups in analyses for aim two. However, due to the small sample size in the sub-groups (smallest group n=8), principle stratification could not be completed. Analyses accounted for the effect of the intervention and the effect of information seeking during refill dispensing by including participants' randomization group in the regression models as a co-variate regardless of significance in bivariate correlations. Regression models with an interaction term between the intervention effect and the effect of information seeking during refill dispensing were also completed for each applicable analysis.

Table 4.40. Information Exchange Groups Divided by Intervention Groups*

	Received Intervention	Information Seeking During Refill Dispensing	n	%
Compliers	Yes	Yes	23	18.3
Always Seekers	No	Yes	8	6.3
Defiers	Yes	No	39	31.0
Never Seekers	No	No	56	44.4

*Total n=126

4.4.2 Analyses for Hypothesis 2.1

Hypothesis 2.1 was to examine if older adults who reported information seeking during refill dispensing had higher levels of medication knowledge at the end of the study period (i.e. month one) when compared to those subjects who did not seek medication information.

Bivariate Comparisons

The relationships between medication knowledge and information seeking, as well as other potential covariates (age, sex, ethnicity, health literacy, total number of medications, information seeking after dispensing) were analyzed by bivariate comparison. An independent samples t-test was utilized to compare differences in medication knowledge between those participants that

sought information during refill dispensing and those that did not. Participants who reported seeking information at the time of refill dispensing had a statistically significant greater medication knowledge score at month one than those who reported no information seeking during refill dispensing (t=-5.415, P<0.001) (see Table 4.40). A Cohen's d value was calculated to determine the effect size, with values greater than 0.2 and less than or equal to 0.5 indicating a small effect size, values greater than 0.5 and less than or equal to 0.8 indicating a medium effect size, and values greater than 0.8 indicating a large effect size (Cohen, 1988). Information seeking at refill dispensing has a large effect size on medication knowledge (Cohens d=1.15).

Continuous covariates included age, total number of medications, and health literacy. The correlation between these covariates and medication knowledge at month one was analyzed utilizing Pearson correlations (see Table 4.41). There were no statistically significant correlations between medication knowledge, age, total number of medications, and health literacy.

Sex and information seeking after dispensing were considered dichotomous and compared to medication knowledge at month one utilizing an independent samples t-tests (see Tables 4.42 and 4.43). There was no statistically significant difference in medication knowledge based on sex. There was a statistically significant difference in medication knowledge between those who sought information after dispensing and those who did not (t= 2.514, p=0.013). The mean medication knowledge of those that sought information after dispensing was 1.020 (SD: 0.377), while the mean medication knowledge of those who did not seek information after dispensing was 0.791 (SD: 0.397) (see Table 4.44). A Cohen's d value was calculated to determine the effect size. Information seeking after dispensing has a medium effect size on medication knowledge (Cohens d=0.592).

Ethnicity was measured as a categorical variable, but only the Black/ African American and White/ Caucasian groups were retained in the analysis due to the small number of participants reporting all other ethnicities (n=6). Ethnicity was compared to medication knowledge at month one utilizing an independent samples t-test with these two remaining groups (see Table 4.45). There was no statistically significant difference in medication knowledge based on ethnicity.

Table 4.41. Independent t-test Comparing Medication Knowledge and Information Seeking During Refill Dispensing

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Medication Knowledge	Equal variances assumed	0.074	0.786	-5.415	119	0.000	-0.414	0.076	-0.565	-0.262
	Equal variances not assumed			-5.515	51.113	0.000	-0.414	0.075	-0.564	-0.263

Table 4.42. Comparing Participant's Mean Medication Knowledge and Information Exchanged After Refill Dispensing

	Information Exchanged at Refill Dispensing	N	Mean	St. Deviation	St. Error Mean
Medication Knowledge	No	91	0.730	0.366	0.038
	Yes	30	1.140	0.353	0.065

Table 4.43. Pearson Correlations of Medication Knowledge at Month One and Potential Covariates

		Medication Knowledge[a]	Total Number of Medications	Age	Health Literacy
Medication Knowledge[a]	Pearson Coefficient		-0.019	-0.030	-0.086
	Sig. (2-tailed)		0.836	0.740	0.347
	N		122	122	122
Total Number of Medications	Pearson Coefficient	-0.019		-0.055	-0.039
	Sig. (2-tailed)	0.836		0.530	0.658
	N	122		132	132
Age	Pearson Coefficient	-0.030	-0.055		-0.115
	Sig. (2-tailed)	0.740	0.530		0.188
	N	122	132		132
Health Literacy	Pearson Coefficient	-0.086	-0.039	-0.115	
	Sig. (2-tailed)	0.347	0.658	0.188	
	N	122	132	132	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

[a]=Knowledge at Month 1

Table 4.44. Independent t-test Comparing Medication Knowledge and Sex

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Medication Knowledge	Equal variances assumed	0.080	0.777	-0.445	120	0.657	-0.043	0.097	-0.235	0.149
	Equal variances not assumed			-0.462	30.057	0.648	-0.043	0.093	-0.234	0.147

Table 4.45. Independent t-test Comparing Medication Knowledge and Information Seeking After Dispensing

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Medication Knowledge	Equal variances assumed	0.140	0.747	-2.514	120	0.013	-0.229	0.091	-0.409	-0.049
	Equal variances not assumed			-2.596	34.272	0.014	-0.229	0.088	-0.408	-0.050

Table 4.46. Participants' Medication Knowledge and Information Seeking After Refill Dispensing

	Information Exchanged After Dispensing	N	Mean	St. Deviation	St. Error Mean
Medication Knowledge(Total PMK)*	No	99	0.791	0.397	0.040
	Yes	23	1.020	0.377	0.079

*Possible Range of Scores for total PMK -1 to 2.

Education level was considered categorical and compared to month one education level utilizing one-way ANOVA (see Table 4.46). All participants who reported receiving an associates degree or above were collapsed into a single category to give sufficient power to detect differences between groups. There were no statistically significant differences in medication knowledge based on education level.

Hierarchical Regression

Hierarchical regression was performed to control for the expected impact of baseline medication knowledge on medication knowledge at month one. Baseline medication knowledge was entered into the regression in step one, and information seeking at refill dispensing and the effect of the intervention were entered in step two. Information seeking after refill dispensing was also entered into the model at step two, as the only statistically significant co-variate from the bivariate analyses (see Table 4.47). The F value of each model was assessed, as well as the change in F value between the two models. A significant F change indicates that the variables added in the second stage of the model are significant even after accounting for the variables in step one of the model.

The interaction term between the effect of information seeking and effect of the intervention was entered into step two, and the resulting model is presented in Table 4.48. The interaction term was not statistically significant and was dropped from the final model resulting in the model in Table 4.49. The overall model is significant ($F=63.115$, $p<0.001$), and the addition of variables after adjusting for baseline medication knowledge led to a statistically significant F change ($p<0.001$). Baseline medication knowledge ($p<0.001$) and information seeking at the time of dispensing ($p< 0.001$) were the only statistically significant individual predictors. A Partial ETA squared value were calculated to determine effect size, with values greater than 0.01 and less than or equal to 0.06 indicating a small effect size, values greater than 0.06 and less than or equal to 0.15 indicating a medium effect size, and values greater than 0.15 indicating a large effect size (Keppel, 1991). Information seeking at refill dispensing had a large effect size on medication knowledge (Partial ETA Squared=0.190). There were statistically significant differences in medication knowledge at the end of the study period after accounting for differences in baseline knowledge, therefore hypothesis 2.1 was supported.

Table 4.47. Independent t-test Comparing Medication Knowledge at Month One and Ethnicity

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Medication Knowledge	Equal variances assumed	1.042	0.309	0.425	115	0.672	0.032	0.076	-0.119	0.183
	Equal variances not assumed			0.418	100.165	0.677	0.032	0.077	-0.121	0.186

Table 4.48. One-Way ANOVA Comparing Medication Knowledge at Month One and Education Level

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.380	3	0.127	0.779	0.508
Within Groups	19.191	118	0.163		
Total	19.571	121			

Table 4.49. Hierarchical Regression Model of Medication Knowledge at Month One

	B	SE B	ß
Step 1			
Constant	0.171	0.055	
Baseline PMK*	0.830	0.062	0.775
Step 2			
Constant	0.138	0.078	
Baseline PMK*	0.743	0.058	0.694
Information Seeking at Refill Dispensing*	0.259	0.052	0.280
Information Seeking After Refill Dispensing	0.104	0.054	0.102
Intervention Effect	0.013	0.044	0.016

*$p<0.001$

** $R^2=0.601$ for Step 1

*** $R^2=0.687$ for Step 2 (Sig. F change $P<0.001$)

Table 4.50. Hierarchical Regression Model Month One Medication Knowledge including Interaction Term Between Information Seeking and Intervention Effect

	B	SE B	ß
Step 1			
Constant	0.171	0.055	
Baseline PMK*	0.830	0.062	0.775
Step 2			
Constant	0.135	0.083	
Baseline PMK*	0.742	0.059	0.693
Information Seeking at Refill Dispensing*	0.281	0.200	0.304
Information Seeking After Refill Dispensing	0.105	0.055	0.103
Intervention Effect	0.015	0.050	0.019
Information Seeking at Refill Dispensing x Intervention Effect	-0.013	0.133	-0.025

*p<0.001

** R^2=0.601 for Step 1

*** R^2=0.687 for Step 2 (Sig. F change P<0.001)

4.4.3 Analyses for Hypothesis 2.2

Hypothesis 2.2 was to examine if older adults who reported seeking medication information during refill dispensing would have more persistent information recall when compared to those subjects who did not seek medication information.

Bivariate Comparisons

Information recall was calculated as a percentage of medication knowledge retained, or a ratio of the month one knowledge score over the baseline score. Participants were required to have a positive knowledge score at baseline to complete this calculation. Participant's with a ratio greater than one were classified as "knowledge gained," those with a ratio of one were classified as "knowledge retained," and those with a ratio less than one were classified as "knowledge lost." Of the 115 participants that had a positive knowledge score at baseline, 46.1% gained knowledge, 9.6% retained knowledge, and 44.3% lost knowledge from baseline to month one (see Figure 4.10). The relationships between information recall and information seeking, as well as other potential covariates (age, sex, ethnicity, health literacy, total number of medications, information seeking after dispensing) were analyzed by bivariate comparison.

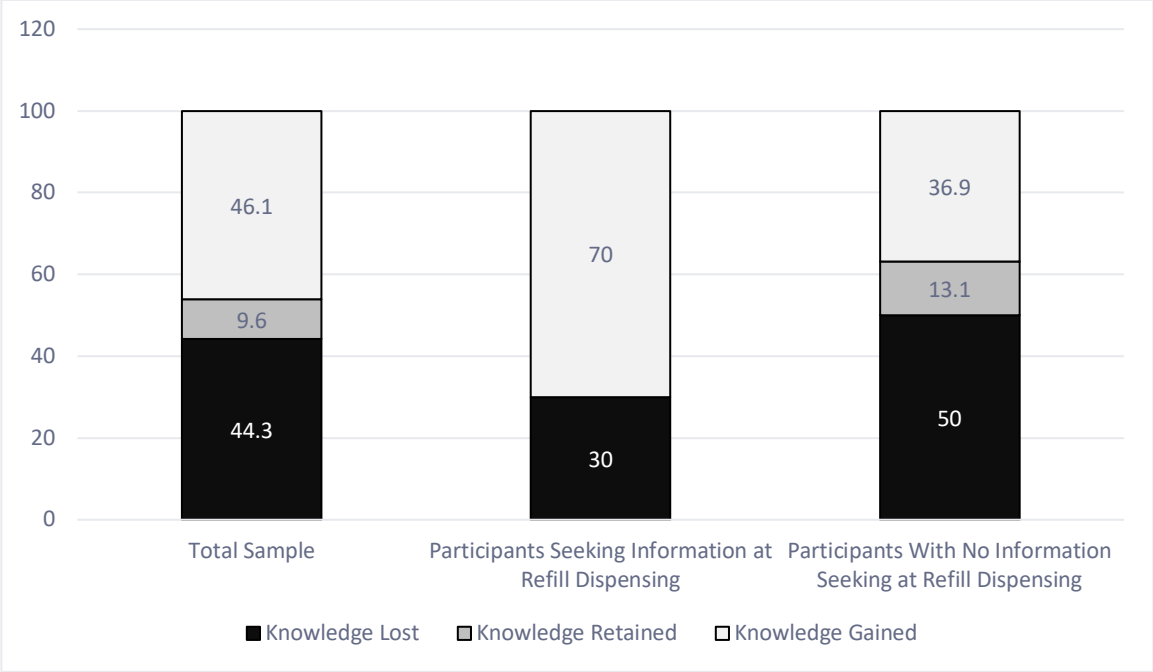


Figure 4.10. Percentage of Information Recall from Baseline to Month One (N=115)

A chi-square test was utilized to compare differences in information recall between those participants that sought information at the time of refill dispensing and those that did not (see Table 4.50). There were statistically significant differences in information recall across information seeking groups (X^2= 11.213, p=0.004). A higher percentage of patients that sought information at refill dispensing gained medication knowledge (70.0%) than those who did not seek information at refill dispensing (36.9%) (see Table 4.51). Cramer's Phi was calculated to determine effect size, with values greater than 0.1 and less than or equal to 0.3 indicating a small effect size, values greater than 0.3 and less than or equal to 0.5 indicating a medium effect size, and values greater than 0.5 indicating a large effect size. Information seeking at refill dispensing had a medium, direct effect on information recall (Phi=0.314).

Continuous covariates included age, total number of medications, and health literacy. These were compared to information recall utilizing one-way ANOVA (see Tables 4.52-4.54). There were no statistically significant differences in information recall based on age, total number of medications, or health literacy. Sex, information seeking after dispensing, ethnicity, and education level were compared to information recall utilizing chi-square tests (see Table 4.50). There was no significant difference in information recall based on sex, information seeking after dispensing, ethnicity, and education level.

Logistic Regression

Logistic regression was performed to assess the impact of information seeking and the intervention on information recall (see Table 4.55). The interaction term between the effect of information seeking and effect of the intervention was not statistically significant and not added to the model. The final overall model is statistically significant (X^2=14.649, p<0.001). Information seeking at the time of dispensing (p< 0.001) was a statistically significant, direct predictor of information recall, and the randomization effect was not statistically significant. A Partial ETA squared value was calculated to determine effect size. Information seeking at refill dispensing had a large effect size on medication recall (Partial ETA Squared= 0.190). There were statistically significant differences in medication recall at the end of the study period based on information seeking at refill dispensing, therefore hypothesis 2.2 was supported.

Table 4.51. Chi Square Comparisons of Information Seeking During Refill Dispensing, Education Level, Ethnicity, Sex, and Information Seeking After Dispensing Verses Information Recall

		Value	df	Asymtotic Significance (2-sided)
Information Seeking During Refill Dispensing	Pearson Chi-Square	11.213	2	0.004
Education Level		4.956	6	0.549
Ethnicity		3.212	2	0.201
Sex		0.056	2	0.972
Information Seeking After Dispensing		3.613	2	0.164

Table 4.52. Information Recall of Participants Across Information Seeking Groups

	Information Recall	N	Percentage
No Information Seeking During Refill Dispensing	Knowledge Lost	42	50.0%
	Knowledge Retained	11	13.1%
	Knowledge Gained	31	36.9%
Information Seeking During Refill Dispensing	Knowledge Lost	9	30.0%
	Knowledge Retained	0	0.0%
	Knowledge Gained	21	70.0%

Table 4.53. One-Way ANOVA Comparing Age and Information Recall

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	69.426	2	34.713	0.805	0.450
Within Groups	4830.522	112	43.130		
Total	4899.948	114			

Table 4.54. One-Way ANOVA Comparing Total Number of Medications and Information Recall

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.149	2	1.075	0.028	0.972
Within Groups	4287.538	112	38.282		
Total	4289.687	114			

Table 4.55. One-Way ANOVA Comparing Heath Literacy and Information Recall

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.619	2	0.310	0.201	0.818
Within Groups	172.302	112	1.538		
Total	172.922	114			

Table 4.56. Multinomial Logistic Regression Information Recall

		95% CI for Odds Ratio		
	B (SE)	Lower	Odds Ratio	Upper
Information Retained				
Intercept	-17.291 (1884.961)			
No Information Seeking During Refill Dispensing	15.449 (1884.961)			
Control Group	0.047 (0.745)	0.243	1.048	4.517
Information Gained				
Intercept	0.827 (0.453)			
No Information Seeking During Refill Dispensing	-1.232 (0.587)	0.092	0.292	0.921
Control Group	0.090 (0.952)	0.169	1.094	7.061

4.4.4 Hypothesis 2.3

Hypothesis 2.3 was to examine if older adults who reported seeking medication information during refill dispensing would have higher necessity beliefs and lower concern beliefs about medication when compared to those subjects who did not seek medication information.

Bivariate Comparisons

The relationships between necessity belief, concern beliefs, and information seeking were analyzed by bivariate comparison. Independent samples t-tests were utilized to compare differences in medication beliefs between those participants that sought information at the time of refill dispensing and those that did not (see Table 4.56 and Table 4.57). There were no statistically significant differences in necessity or concern beliefs based on information seeking, and analysis was not continued to multivariate regression. Hypothesis 2.3 was not supported.

4.4.5 Hypothesis 2.4

Hypothesis 2.3 was to examine if older adults who reported seeking medication information during dispensing would have higher communication and target efficacy scores for pharmacists at the end of the study period (i.e. month one), when compared to those subjects who did not seek medication information.

Bivariate Comparisons

The relationships between efficacy assessments and information seeking, as well as other potential covariates (age, sex, ethnicity, health literacy, total number of medications, information seeking after dispensing) were analyzed by bivariate comparison. Independent samples t-tests were utilized to compare differences in efficacy beliefs between those participants that sought information at the time of refill dispensing and those that did not (see Tables 4.58 and 4.59). Participants who reported seeking information at the time of refill dispensing had a statistically significant greater communication efficacy and target efficacy (honesty and ability) for pharmacists at month one than those who reported not seeking information (see Table 4.60 and 4.61).

Table 4.57. Independent t-test Comparing Necessity Beliefs and Information Seeking During Refill Dispensing

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Necessity Beliefs	Equal variances assumed	0.287	0.593	0.079	123	0.937	0.065	0.822	-1.562	1.691
	Equal variances not assumed			0.078	48.183	0.938	0.065	0.827	-1.598	1.728

Table 4.58. Independent t-test Comparing Concern Beliefs and Information Seeking During Refill Dispensing

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Concern Beliefs	Equal variances assumed	0.000	0.983	1.614	123	0.109	0.968	0.600	-0.220	2.156
	Equal variances not assumed			1.608	48.415	0.114	0.968	0.602	-0.243	2.179

Table 4.59. Independent t-test Comparing Communication Efficacy and Information Seeking

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Communication Efficacy	Equal variances assumed	11.637	0.001	-3.317	122	0.001	-0.991	0.299	-1.583	-0.400
	Equal variances not assumed			-4.891	114.829	0.000	-0.991	0.203	-1.393	-0.590

Table 4.60. Independent t-test Comparing Target Efficacy (Honesty and Ability) and Information Seeking

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Target Efficacy	Equal variances assumed	3.588	0.061	-3.471	122	0.001	-0.823	0.237	-1.292	-0.354
	Equal variances not assumed			-3.846	58.965	0.000	-0.823	0.214	-1.251	-0.395

Table 4.61. Communication Efficacy Difference in Mean Based on Information Seeking During Refill Dispensing

	Information Exchanged After Dispensing	N	Mean	St. Deviation	St. Error Mean
Communication Efficacy	No	94	5.642	1.592	0.164
	Yes	30	6.633	0.651	0.119

Table 4.62. Target Efficacy Difference in Mean Based on Information Seeking During Refill Dispensing

	Information Exchanged After Dispensing	N	Mean	St. Deviation	St. Error Mean
Target Efficacy Pharmacists	No	94	5.560	1.178	0.121
	Yes	30	6.383	0.965	0.176

A Cohen's d value was calculated to determine the effect size, with values <0.2 indicating a small effect size, values greater than 0.5 indicating a medium effect size, and values >0.8 indicating a large effect size (Cohen, 1988). Information seeking at refill dispensing has a large, direct effect on communication efficacy (Cohens d=0.815), and medium, direct effect size on target efficacy (Cohens d=0.764).

Continuous covariates included age, total number of medications, and health literacy. The correlation between these covariates and efficacy assessments were analyzed utilizing Pearson correlations (see Table 4.62 and 4.63). There were no statistically significant correlations between communication efficacy, age, total number of medications, and health literacy.

Table 4.63. Pearson Correlations of Communication Efficacy and Potential Covariates

		Communication Efficacy[a]	Total Number of Medications	Age	Health Literacy
Communication Efficacy[a]	Pearson Coefficient		-0.017	0.017	-0.093
	Sig. (2-tailed)		0.853	0.851	0.302
	N		125	125	125
Total Number of Medications	Pearson Coefficient	-0.017		-0.055	-0.039
	Sig. (2-tailed)	0.853		0.530	0.658
	N	125		132	132
Age	Pearson Coefficient	0.017	-0.055		-0.115
	Sig. (2-tailed)	0.851	0.530		0.188
	N	125	132		132
Health Literacy	Pearson Coefficient	-0.093	-0.039	-0.115	
	Sig. (2-tailed)	0.302	0.658	0.188	
	N	125	132	132	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

[a]=Communication Efficacy at Month 1

Table 4.64. Pearson Correlations of Target Efficacy and Potential Covariates

		Target Efficacy	Total Number of Medications	Age	Health Literacy
Target Efficacy	Pearson Coefficient		-0.115	-0.026	0.048
	Sig. (2-tailed)		0.200	0.770	0.597
	N		125	125	125
Total Number of Medications	Pearson Coefficient	-0.115		-0.055	-0.039
	Sig. (2-tailed)	0.200		0.530	0.658
	N	125		132	132
Age	Pearson Coefficient	-0.026	-0.055		-0.115
	Sig. (2-tailed)	0.770	0.530		0.188
	N	125	132		132
Health Literacy	Pearson Coefficient	0.048	-0.039	-0.115	
	Sig. (2-tailed)	0.597	0.658	0.188	
	N	125	132	132	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

[a]=Target Efficacy at Month One

Sex, ethnicity, and information seeking after dispensing were considered dichotomous and compared to month one communication efficacy and target efficacy utilizing independent samples t-tests (see Tables 4.64-4.69). There were no statistically significant differences in efficacy assessments based on age or ethnicity. Participants who reported seeking information after dispensing had statistically significant greater communication efficacy scores at month one, than those who reported not seeking information (see Table 4.70). A Cohen's d value was calculated to determine the effect size, with values <0.2 indicating a small effect size, values greater than 0.5 indicating a medium effect size, and values >0.8 indicating a large effect size (Cohen, 1988). Information seeking after refill dispensing has a direct, medium effect size on communication effficacy (Cohens d=0.592).

Education level was compared to month one medication knowledge utilizing one-way ANOVA (see Table 4.71-4.72). All participants who reported receiving an association degree or above were collapsed into a single category to give sufficient power to detect differences between groups. There were no statistically significant differences in communication efficacy based on education level.

Hierarchical Regression

Hierarchical regression was performed to control for the expected impact of baseline efficacy assessments on month one communication and target efficacy. Baseline efficacy assessments were entered into the regression in Step 1, and information seeking at refill dispensing and the effect of the intervention were entered in Step 2 (see Tables 4.73 and 4.74).The interaction term between the effect of information seeking and effect of the intervention was entered into Step 2, and the resulting model is presented in Table 4.75 and 4.76. The interaction term was not significant and was dropped from both models resulting in the models in Tables 4.73 and 4.74 serving as the final models.

The overall model for communication efficacy is significant ($F=106.329$, $p<0.001$), and the addition of variables after adjusting for baseline communication efficacy led to a statistically significant F change ($p=0.046$). Baseline communication efficacy ($p<0.001$) and information seeking at the time of dispensing ($p= 0.015$) were the only statistically significant individual predictors.

Table 4.65. Independent t-test Comparing Communication Efficacy and Sex

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Communication Efficacy	Equal variances assumed	1.082	0.300	0.855	123	0.394	0.303	0.354	-0.398	1.005
	Equal variances not assumed			0.919	30.882	0.365	0.303	0.330	-0.370	0.976

Table 4.66. Independent t-test Comparing Target Efficacy and Sex

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Target Efficacy	Equal variances assumed	3.729	0.056	1.155	123	0.250	0.325	0.281	-0.232	0.882
	Equal variances not assumed			1.505	40.771	0.140	0.325	0.216	-0.111	0.761

Table 4.67. Independent t-test Comparing Communication Efficacy and Ethnicity

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Communication Efficacy	Equal variances assumed	0.347	0.557	0.059	118	0.953	0.016	0.278	-0.534	0.567
	Equal variances not assumed			0.059	114.100	0.953	0.016	0.276	-0.531	0.564

Table 4.68. Independent t-test Comparing Target Efficacy and Ethnicity

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Target Efficacy	Equal variances assumed	0.401	0.528	-0.009	118	0.993	-0.002	0.217	-0.431	0.427
	Equal variances not assumed			-0.009	110.075	0.993	-0.002	0.217	-0.433	0.429

Table 4.69. Independent t-test Comparing Communication Efficacy and Information Seeking After Dispensing

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Communication Efficacy	Equal variances assumed	6.960	0.009	-2.174	123	0.032	-0.720	0.331	-1.375	-0.064
	Equal variances not assumed			-3.472	90.488	0.001	-0.720	0.207	-1.132	-0.308

Table 4.70. Independent t-test Comparing Target Efficacy and Information Seeking After Dispensing

		Levene's test for equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
Month One Target Efficacy	Equal variances assumed	1.324	0.252	-1.273	123	0.205	-0.340	0.267	-0.868	0.188
	Equal variances not assumed			-1.441	41.037	0.157	-0.340	0.236	-0.816	0.137

Table 4.71. Communication Efficacy Difference in Mean Based on Information Seeking after Refill Dispensing

	Information Exchanged After Dispensing	N	Mean	St. Deviation	St. Error Mean
Communication Efficacy	No	101	5.753	1.586	0.158
	Yes	24	6.472	0.659	0.134

Table 4.72. One-Way ANOVA Comparing Communication Efficacy and Education Level

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.491	3	1.497	0.678	0.567
Within Groups	267.015	121	2.207		
Total	271.506	124			

Table 4.73. One-Way ANOVA Comparing Target Efficacy and Education Level

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.473	3	2.158	1.578	0.198
Within Groups	165.505	121	1.368		
Total	171.978	124			

Table 4.74. Hierarchical Regression Communication Efficacy

	B	SE B	ß
Step 1			
Constant	0.628	0.271	
Baseline Communication Efficacy*	0.901	0.045	0.877
Step 2			
Constant	0.835	0.316	
Baseline Communication Efficacy*	0.870	0.046	0.847
Information Seeking at Refill Dispensing*	0.394	0.160	0.114
Intervention Effect	-0.117	0.135	-0.039
Information Seeking After Refill Dispensing	0.256	0.163	0.068

*$p<0.001$

**$R^2= 0.769$ for Step 1

***$R^2= 0.784$ for Step 2 (Sig. F change P=0.046)

Table 4.75. Hierarchical Regression Target Efficacy

	B	SE B	ß
Step 1			
Constant	0.593	0.249	
Baseline Target Efficacy*	0.910	0.043	0.889
Step 2			
Constant	0.300	0.282	
Baseline Target Efficacy*	0.889	0.043	0.869
Information Seeking at Refill Dispensing	0.159	0.120	0.058
Intervention Effect*	0.250	0.101	0.106

*$p<0.001$

** $R^2= 0.790$ for Step 1

*** $R^2= 0.808$ for Step 2 (Sig. F change P=0.005)

Table 4.76. Hierarchical Regression Communication Efficacy (Interaction Term Added)

	B	SE B	ß
Step 1			
Constant	0.628	0.271	
Baseline Communication Efficacy*	0.901	0.045	0.877
Step 2			
Constant	0.860	0.330	
Baseline Communication Efficacy*	0.871	0.046	0.847
Information Seeking at Refill Dispensing	0.231	0.604	0.067
Intervention Effect	-0.136	0.151	-0.046
Information Seeking at Refill Dispensing x Intervention Effect	0.096	0.344	0.051
Information Seeking After Refill Dispensing	0.250	0.165	0.067

*$p<0.001$

** $R^2= 0.769$ for Step 1

*** $R^2= 0.784$ for Step 2 (P=0.090)

Table 4.77. Hierarchical Regression Target Efficacy (Interaction Term Added)

	B	SE B	ß
Step 1			
Constant	0.593	0.249	
Baseline Target Efficacy*	0.910	0.043	0.889
Step 2			
Constant	0.406	0.285	
Baseline Target Efficacy*	0.893	0.042	0.872
Information Seeking at Refill Dispensing	-0.635	0.443	-0.232
Intervention Effect	0.158	0.111	0.067
Information Seeking at Refill Dispensing x Intervention Effect	0.467	0.251	0.312

*$p<0.001$

**$R^2= 0.790$ for Step 1

***$R^2= 0.813$ for Step 2 (P=0.003)

A Partial ETA squared value was calculated to determine effect size, with values >0.01 indicating a small effect size, values >0.06 indicating a medium effect size, and values >0.15 indicating a large effect size (Keppel, 1991). Information seeking at refill dispensing had a large effect size on communication efficacy (Partial ETA Squared= 0.049).

The overall model for target efficacy is significant (F=165.237, p<0.001), and the addition of variables after adjusting for baseline target efficacy led to a significant F change (p=0.005). Baseline target efficacy (p<0.001) and the intervention effect (p= 0.015) were the only significant individual predictors. A Partial ETA squared value was calculated to determine effect size, with values >0.01 indicating a small effect size, values >0.06 indicating a medium effect size, and values >0.15 indicating a large effect size (Keppel, 1991). The intervention effect had a small effect size on target efficacy (Partial ETA Squared= 0.049).

There were statistically significant differences in communication efficacy, but not target efficacy at the end of the study period. After accounting for differences in baseline efficacy scores, and hypothesis 2.4 was partially supported in that information seeking during refill dispensing was statistically significantly correlated with communication efficacy but not target efficacy.

4.5 Notes

Hair, J. F., Balck, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (1998). *Multivariate Data Analysis, vol. 6*. Prentice-Hall.

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CHAPTER 5. DISCUSSION

The aims of this study were to: 1) explore the relationships between information seeking attitudes and medication information seeking behaviors and 2) to describe the relationships between information seeking at the time of medication dispensing and medication outcomes. Descriptive results will be compared to previous studies, followed by a discussion of how the results of each aim relate to other available research. The chapter will conclude with a discussion of the strengths and limitations of the study and directions for future research.

5.1 Discussion of Descriptive Results

5.1.1 Demographics

A majority of study participants were female (82.6%). In this sample, there were 21 males for every 100 females, as compared to 79 males for every 100 females based on the general United States population of adults 65 and older. In the United States 2016 census data, the number of males per 100 females dropped as age increased, with only 56 males for every 100 females in those aged 85 and older. The average age of the sample of this study was 74.89 (SD: 6.73). Females are more likely to participate in research than males, especially in the older adult populations and in face-to-face and telephone interviews, which may explain the higher participation rate of females in this study population (Mudler, 2019).

Among adults 65 and older in the general United States population, 15.6% have less than a high school degree, 27.3% are high school graduates, 25.0% have some college or an associate's degree, and 32.1% have a bachelor's degree or higher. Among study participants, 25% had less than a high school degree, 35.6% were high school graduates, 27.3% had some college or an associate's degree, and 12.1% had a bachelor's degree or higher. A higher percentage of participants in this study had lower education levels. The study sample also included a higher percentage of Black/ African-American participants than in the general United States population of adults over 65 (7.2%). The differences in race are likely due to the urban setting of the study.

5.1.2 Uncertainty Discrepancy

Uncertainty discrepancy was measured as the difference between participants current and desired level of uncertainty. Although a majority of participants reported desiring more certainty about their medications than they currently had, approximately 3% desired less certainty. This indicates that some individuals may avoid medication information, no matter who provides the information, due to the potential mental dissonance or discomfort that medication information may cause (Case, 2005). The percentage of participants who desired more certainty about their medication doubled in size baseline to month one. A secondary analysis of individuals who had increasing uncertainty discrepancy from baseline to month one has not yet been conducted, so it is unknown whether these differences were due to changes in the participants' attitudes over time, the study procedures (e.g. asking the patient questions about their medications), or the impact of the intervention.

5.1.3 Target Efficacy

Target efficacy, or the extent to which individuals perceive the information provider as willing and able to communicate the information to the seeker was measured as a combination of honest (i.e. availability) and ability. Overall, participants had positive perceptions concerning the pharmacists' availability and their ability to provide medication information. Fifty percent of participants strongly agreed that pharmacists were available to talk about medications, but fewer participants strongly agreed that pharmacists wanted to talk to them about their medications (25.4%) and pharmacists had time to talk to them about medications (31.5%). Results from this study indicate that measures of pharmacists' availability should include indicators of pharmacists' time and their desire to participate in information provision.

5.1.4 Outcome Assessments

Outcome assessments, or the expected outcomes of information management behaviors, were measured with five scenarios representing potential positive outcomes of medication information seeking (i.e. positive outcome expectancies), and five scenarios representing potential negative outcomes of medication information seeking (i.e. negative outcome expectancies). These

scenarios were newly developed for this study based on an unpublished qualitative study focused on community pharmacists as information providers.

A majority of participants agreed or strongly agreed with positive outcome expectancies related to getting more benefit from the medication, knowing more about the medication, increased confidence managing medication, and it being easier to take medication correctly as a result of asking a pharmacy questions. However, participants were less sure that speaking with a pharmacist about their medication would decrease their chances of having problems with their medicine.

Participants' responses towards the potential negative outcomes of seeking information were varied. However, it is notable that 22.6% of participants felt that if they asked the pharmacist questions about their medications, it was extremely likely other patients waiting would get upset. Another 33.9% felt that it was slightly or quite likely that other patients waiting would get upset. In total, 56% of the sample felt that it was at least slightly likely that other patients may get upset if they asked the pharmacist questions during prescription pick-up. Individuals outside the pharmacist-patient dyad may have an impact on the information exchange process, and the lack of privacy in community pharmacy settings may have a negative impact on patients' willingness to ask medication-related questions during medication dispensing. However, private space to speak with a pharmacist may not solve all of patients' concerns when a pharmacist's time is divided among multiple patients. While private consultation areas may give patients and pharmacists space to discuss private health concerns, patients may still be concerned about others' responses if asking questions causes an increased wait time for other patients.

5.1.5 Coping efficacy

Measures for coping efficacy, or the extent to which individuals have the resources to use information given to them and deal with negative potential outcomes of information seeking, have performed inconsistently in past studies and have not been assessed in studies focused on medication-related information seeking. For this study, we measured coping efficacy as a participant's ability to cope with the same five scenarios that were developed to measure negative outcome expectancies. When tested as a single construct, the items had poor reliability. Anecdotally, many participants in this sample were uncertain about the phrasing "the ability to cope," and some expressed that the word "cope" was too severe for the scenarios that were presented. Future measurement scales should consider alternate wordings for coping. Participants'

responses in the ability to cope across the different negative scenarios may also indicate the need to consider a broader range of potential negative outcomes such as loss of privacy for health information and receiving conflicting information from multiple providers. As cases are expanded, there may be multiple types of coping efficacy that need to be captured in future measurements with specific consideration needed in separating the coping with the information received from coping with the negative impact of seeking the information.

Past work has suggested that the conceptualization of coping efficacy be expanded beyond the negative effects of the information to also include negative effects of seeking information (Afifi & Afifi, 2009; Merrill & Afifi, 2012). The five scenarios developed for this study included two items that focused on the results of the information and three that focused on the effects of the information seeking. However, the two items focused on the results of the information continued to be problematic. The three items that focused on the effects of information seeking were separated the other scenarios in the analysis and this three-item measure demonstrated good fit in the measurement model and were retained in the structural model.

5.1.6 Medication Information Management Behaviors

A majority (78.5%) of participants reported asking a pharmacist a question about their medications at least once over the previous six months and 86.2% reported asking a physician a question about their medications at least once over the previous six months (prior to baseline data collection). Patients were more likely to report seeking information from physicians and pharmacists as compared to friends and family or the internet. This is consistent with past research that suggests older adults seek information from health care providers more than any other source (Altizer et al., 2013; L A Morris et al., 1987; Turner et al., 2018). However, participants also reported information avoidance. Over the previous six months, a slight majority (50.8%) reported avoiding asking a pharmacist questions about medications, and 40.0% reported avoiding asking a physician questions about their medications. While pharmacists and physicians are important sources of information for older adults, barriers to seeking information from these sources such as lack of time, fear of embarrassment, and lack of patient knowledge about pharmacists' role in the medication information provision process should also be considered (Krueger 2011, Seubert 2017, Paluck 2003).

A higher percentage of older adults reported searching the internet for answers to questions about their medications than asking a friend of family member. Over half (56.9%) reported never asking friends and family questions about medications. Although past work has reported less digital information seeking in the older adult population as compared to younger adults, national trends indicate increases in computer (including smart phones) ownership and internet access among adults over 65 (Roberts, 2018). Digital information seeking may be an increasingly important source of medication information in the older adult population in the future. While health care providers continue to be the most frequently utilized source for medication information, other sources such as the internet may also have a role in medication information provision.

5.1.7 Medication Information Management Behaviors During Study Period

In addition to their MIMB over the previous six months, participants were also asked to report their MIMB at baseline and month one of the study. At baseline, participants were asked if they talked with a healthcare provider about their new medication during the initial prescribing or dispensing. Participants were also asked about any other information seeking they had completed from the time of initial prescribing to the day of baseline data collection. Participants had been prescribed their new prescription for 1-81 days at the time of baseline data collection with a mean of 43.6 (SD: 13.8) days between initial prescribing and baseline data collection.

A majority of participants reported that they did not exchange information about their new medicine at initial prescribing (62.3%) or initial dispensing (85.4%). Of those that exchanged information at prescribing, 38.8% reported exchanging information with a nurse. This suggests that nurses play an important role in providing information about new medication to older adults in the outpatient setting.

Participants were more likely to initiate information exchange than pharmacists during the initial dispensing of a new medication. Pharmacists initiated counseling during the dispensing of 5% of new prescriptions for chronic medications. Indiana law requires pharmacists to offer counseling to all patients, and some community pharmacy corporate policies additionally require counseling during initial dispensing (e.g. “first fill counseling”). Others corporate policies require follow-up calls after initial dispensing (e.g. “new to therapy calls”), and some do not require any additional counseling or follow-up beyond the Indiana pharmacy law requirement to offer counseling. In the study sample, only one patient reported exchanging information with a

pharmacist after the initial dispensing of a new medication. Project PROMISE did not specifically collect data about the type of pharmacy the participants used to fill their prescriptions, so it unknown how many of these patients visited pharmacies where counseling or follow-up is required.

A majority of participants (66.9%) reported seeking medication information in the time between initial dispensing and baseline data collection. Participants had continued demand for medication information after prescribing and dispensing of the medication. Of those that reported seeking medication information after dispensing, 78.2% reported utilizing the information leaflet that came with the medication from the pharmacy, as one of their sources of information. Information leaflets and medication guides may be important sources of medication information for older adults. However, frequency of use does not necessarily translate into usefulness or effectiveness of the information. Information leaflets frequently use small font and have high readability scores, which may make them difficult for older adults to understand (Liu et al., 2014). In addition, leaflets do not typically contain medication information that is specific to older adults (Liu et al., 2014).

Participants' medication information exchange increased from 14.6% during initial dispensing to 24.6% during refill dispensing. Only 6.3% of participants sought information from a pharmacist without being specifically asked to do so as a part of the intervention. This suggests information seeking during refill dispensing may be low in older adults. This is especially concerning since there was only one instance of pharmacist-initiated counseling at the time of refill. Overall, these results suggest that patients are very unlikely to speak to a pharmacist after their initial dispense of new medication without intervention.

An intervention was designed for the study with the intention of increasing variation in information seeking behaviors in the community pharmacy setting. Of the 62 patients in the intervention group, 62.9% were considered "defiers," and did not seek information from a pharmacist, even when they had specifically agreed to do so as a part of the project. Although some patients may have forgotten to ask the pharmacist questions during refill dispensing, this may also point to barriers that individuals experience when seeking information from a pharmacist. Despite the high percentage of "defiers," the intervention still led to an increase in information seeking. Among those that sought information from a pharmacist during refill dispensing, participants were three times more likely to have been complying with the intervention, than seeking out the information on their own accord.

5.1.8 Medication Knowledge

To facilitate comparison with past studies, the average medication knowledge scores at baseline and month one were categorized as no medication knowledge, insufficient medication knowledge, sufficient medication knowledge, and optimal medication knowledge (see Table 5.1). Score cut-offs were adapted from the most comprehensive test of medication knowledge across past studies (Romero-Sanchez et al., 2016). Based on these cut-offs, 92.2% of participants had inadequate knowledge at baseline (see Table 5.2) and 87.3% of participants had inadequate knowledge at month 1 (see Table 5.3). In a previous study of 7,278 adults, investigators concluded that 71.9% of participants had inadequate knowledge. Compared to the current sample, participants were younger with an average age of 54, and 37.1% of the participants were taking only one medication. Age and increased numbers of medications have both been associated with decreased medication knowledge in past studies (Chan et al., 2013; Najjar et al., 2015).

Table 5.1. Medication Knowledge Category Definitions and Frequencies at Baseline and Month One*

Dichotomous Group	Category	Range[a]	Baseline Frequency	Month One Frequency
Inadequate medication knowledge	No medication knowledge	Total average score <0.59	34 (26.6%)	34 (28.8%)
	Insufficient medication knowledge	Total average score 0.6-1.26	84 (65.6%)	69 (58.5%)
Adequate medication knowledge	Sufficient medication knowledge	Total average score 1.27-1.60	8 (6.3%)	11 (9.3%)
	Optimal medication knowledge	Total average score 1.61-2	2 (1.6%)	4 (3.4%)

[a]Total possible range for medication knowledge scores was -1 to 2

[b]n=128

[c]n=118

The previous study also had a higher percentage of patients with no medication knowledge and a lower percentage with insufficient medication knowledge. This may be due to the investigators decision to score any participant with a zero score for indication, dosage, frequency, duration of treatment, or form or administration as a total score of zero (i.e. no medication knowledge) (Romero-Sanchez et al., 2016). This percentage of insufficient knowledge is higher than other past studies that included a smaller number of medication domains in the knowledge measurement. Even though the average total medication knowledge score improved from baseline to month one in this study, it is notable that 87.3% continued to have inadequate medication knowledge at the end of the study period.

Looking at individual item scores, participants were most likely to give correct answers for usage instructions and indications, and most likely to give incorrect answers for contraindications/ warnings and precautions. These results add additional evidence to past studies that indicate medication risks are the most frequently identified deficiency in medication knowledge (Barat et al., 2001; Chan et al., 2013; Mira et al., 2014; Modig et al., 2009; O'Connell & Johnson, 1992). Mean scores for medication knowledge domain scores were compared to mean scores from previous studies in Table 5.3 (Barat et al., 2001; Bazargan & Barbre, 1992; Blenkiron, 1996; Bosch-Lenders et al., 2016; BURNS et al., 1990; Chan et al., 2013; Chung & Bartfield, 2002; Cline et al., 1999; Cruz et al., 2011; Hayes, 1999; Hoisnard et al., 2018; Hope et al., 2004; Kristensson et al., 2010; Mira et al., 2014; Modig et al., 2009; Mosher et al., 2012; Najjar et al., 2015; O'Connell & Johnson, 1992; Pinto et al., 2016; Sela-Katz et al., 2010; Spiers et al., 2004). Items regarding effectiveness of the medication, duration of treatment, frequency of the medication in relation to meals, and response to side effects are not included in Table 5.3, because Project PROMISE is the first study to measure these knowledge domains in a sample of older adults.

Participants had a higher percentage of correct scores for side effects and contraindications and warnings than that of previous studies. This could be due to the way that "correct answers" were defined. In the medication knowledge rubric developed for this study, only one side effect or precaution was required to receive a correct score. Similarly, over 50% of participants gave a correct answer for interactions at baseline, compared to a single past study that claimed that no one sampled could name an interaction of their medication (Barat et al., 2001).

Table 5.2. Comparison of Medication Knowledge Scores to Previous Studies

	Indication Percentage Correct	Name Percentage Correct	Usage Instructions Percentage Correct	Frequency-Timing Percentage Correct	Side Effects-Descriptive Percentage Correct	Contraindications Precautions Warnings Percentage Correct	Interactions Percentage Correct	Storage Percentage Correct
Project PROMISE baseline[1]	66.3	57.2	72.0	64.4	20.1	30.7	52.7	10.6
Project PROMISE month one[1]	68.2	54.8	71.6	68.8	23.2	31.6	48.0	9.6
Mean score from previous studies	64.2	64.1	65.2	68.5	11.5	11.0	0.0[2]	59.7
Range of scores from previous studies	15-87	29-81	18-99	18-94	4-21	4-24	0.0[2]	27-92

[1] Mean percentage of participants receiving score of "correct answer"

[2] Based on the results of a single study

Scorers in this study were provided a list of the participants current medications, along with the knowledge responses. If a participant indicated that there were no interactions between their new medication and their current medications, and the pharmacist scores found no interactions with the list they were provided, the answer was scored as correct. Therefore, only in cases where patients had clinically meaningful interactions between their current medication and those on their medication list were they required to actually provide the specifics of an interaction. Very few participants named a specific interaction that was related to their medication. This difference in measurement raises an important question about what role clinical judgement plays in the measurement of medication knowledge in studies.

The percentage of correct storage scores was lower in Project PROMISE, than in previous studies. The rubric required participants to refer to both the temperature and humidity in their responses to be scored as correct. Past studies were dichotomous, allowed for "incomplete" answers, or did not describe how answers were determined to be correct (Mira et al., 2014; Najjar et al., 2015).

5.1.9 Medication Beliefs

Medication beliefs sub-scale scores at baseline and month one are compared to the mean scores in previous studies in Table 5.3 (Bae et al., 2016; Cicolini et al., 2016; Clyne et al., 2017; Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Fawzi et al., 2012; Federman et al., 2013a; Hong, 2019; McLoughlin et al., 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Schüz et al., 2011a; Sirey et al., 2013; Straßner et al., 2020; E. Unni et al., 2015; E. J. Unni & Farris, 2011). While necessity scores were very similar to past work, concern scores were lower in the current sample as compared to previous studies in older adults. While the reasoning for this difference is unknown, anecdotal evidence from the phone interviews suggests that participants placed a very high level of trust in their physicians. Project PROMISE was conducted in a sample of older adults whom were being seen in a specialty senior clinic, instead of a general population. The clinic in an urban setting and selected due to its large population of older adults on chronic medications and ability to specifically target lower-education levels and non-White participants. Increased attention towards the specific concerns of the older adults in this sample could potentially lead to decreased concerns about their medications overall.

Table 5.3. Comparison of Medication Beliefs Scores to Previous Studies

	Necessity Sub-scale[2]	Concern Sub-scale[2]	Harm Sub-scale[2]	Overuse Sub-scale[2]
Project PROMISE baseline[1]	3.84	2.26	2.23	2.83
Project PROMISE month 1[1]	3.88	2.30	2.21	2.88
Mean score from previous studies[1]	3.87	3.58	2.88	2.53
Range of scores from previous studies	3-5	2-6	2-3	2-3

[1]Mean sub-scale score divided by the number of items in the scale.

[2]5-point Likert scale with 1 being strongly disagree and 5 being strongly agree.

Harm scores were slightly lower than previous studies and overuse scores were slightly higher. The higher overuse scores may be due to the high number of average medications in this sample.

5.2 Discussion of Aim 1 Results

The first aim of the study was to describe older adults' attitudes about medication information seeking, and the relationships between those attitudes and medication information seeking behaviors. Results of each hypotheses related to aim one are discussed below.

5.2.1 Hypothesis 1.1

Hypothesis 1.1 was to examine if the magnitude of discrepancy between older adults' current perceived level of uncertainty about medications and their desired level of uncertainty about medications (uncertainty discrepancy) would be positively correlated with active medication information-seeking behaviors and negatively correlated with avoidance. Uncertainty discrepancy was not directly related to information seeking or avoidance in the final structural models for pharmacists or physicians.

The results differ from recent data, such as the 2020 meta-analysis that suggested adding these direct paths in future research utilizing the Theory of Motivated Information Management, or the TMIM (Kuang & Wilson, 2020). However, the results are in agreement with the original TMIM theory, as the theory did not suggest a direct relationship between uncertainty discrepancy and information management behaviors (Afifi & Weiner, 2004), but instead suggested that the relationship between uncertainty and information management was completely mediated by outcome and efficacy assessments. The results from this study are also congruent with past research in that participants desired more information about their medications (Nair et al., 2002; Raynor et al., 2004), but frequently refused offers to receive more information from pharmacists (Krueger & Hermansen-Kobulnicky, 2011).

One reason that is frequently cited in clinical practice for the lack of direct relationship between patient's desire for information and their information seeking behaviors is the idea that patients have inaccurate perceptions of their own uncertainty. Because patients "don't know what they don't know" they are not motivated to seek out additional information. The data in this study

supports this explanation. The correlation between actual medication knowledge scores and uncertainty discrepancy was not significant at baseline (Pearson correlation -0.164, p=0.063) or month 1 (Pearson correlation 0.107, p=0.244). However, the lack of direct relationship between uncertainty discrepancy and information management behaviors suggests that even when participants recognize their own uncertainty it did not increase the likelihood that they would seek out medication information. These results emphasize the importance of including additional mediating variable such as outcome assessments and efficacy assessments, between patient uncertainty and their MIMB.

5.2.2 Hypothesis 1.2

Hypothesis 1.2 was to examine if the magnitude of older adults' uncertainty discrepancy would be positively correlated with anxiety about their perceived uncertainty. The relationship between uncertainty discrepancy and anxiety was statistically significantly with a standardized residual of 0.329 (SD: 0.089). Events or interventions that increase patients' uncertainty about their medications may also cause patients to feel anxiety or worry about their uncertainty. These results are in line with other TMIM studies in healthcare contexts that also found that uncertainty discrepancy predicted anxiety (Fowler & Afifi, 2011; Rauscher & Hesse, 2014; Thiel, 2017).

5.2.3 Hypothesis 1.3

Hypothesis 1.3 was to examine if the intensity of older adults' anxiety about their uncertainty about medications would be negatively correlated with their outcome and efficacy assessments. In the final structural model for pharmacists, anxiety was statistically significantly related to negative outcome expectations (standardized residual -0.358 (0.072)), communication efficacy (standardized residual -0.254 (0.077)), and coping efficacy (standardized residual -0.267 (0.071)). Negative outcome assessments were reverse coded for this analysis, so the negative association indicates an increase in participant perception of potential negative outcomes. Anxiety was not statistically significantly related to positive outcome expectations or target efficacy.

In past TMIM studies in the healthcare context, the relationship between anxiety and outcome assessments has been inconsistent. One study focused on mental well-being found no link between efficacy assessments and anxiety (Lindley, 2015). In another study focused specifically

on patients' intentions to seek medication information, investigators found a relationship between negative outcome assessments only and anxiety (Huston, 2013). Another Australian study focuses on patients' intentions to use Home Medicines Review found only moderate effects of anxiety on outcome assessments (Carter et al., 2013a). The differences in relationships between negative and positive outcome assessments may indicate the continued need to treat these constructs individually, and not as a higher order factor in future models.

The results of Project PROMISE also suggest that anxiety about medication uncertainty does not impact participants' perceptions of the pharmacists or physicians as information providers, or their assessment of the potential positive outcomes of information seeking. Anxiety about medication uncertainty can, however, impact patients' perceptions of the potential negative impact of seeking medication information, and also their perceptions of their personal ability to cope with the negative results of seeking information. Anxiety may also negatively impact a patient's personal perception of their ability to communicate with healthcare providers. Attempts to increase patient uncertainty with an expectation of increasing information seeking should also consider the potential negative impacts of increasing patients' anxiety about that uncertainty. In particular, interventions targeting uncertainty should support patients' personal efficacy for coping and communication. Without these considerations any increased information seeking as a result of increased uncertainty may be circumvented by decreases in individuals' perceptions of their ability to communicate with information providers or cope with the negative outcomes they expect as a result of seeking information. Clinical providers and researchers should be aware of the potential negative unintended consequences of increasing information seekers' anxiety.

5.2.4 Hypothesis 1.4

Hypothesis 1.4 was to examine if the linear combination of outcome assessments and coping efficacy would be positively correlated with active medication information-seeking and negatively correlated with avoidance. A higher order factor was not identifiable in structural equation modeling, resulting in the addition of individual constructs to the model. Some past studies measured outcome assessments as a single measured variable, instead of two separate latent constructs by asking patients if there were more positive than negative impacts of seeking information (Bigsby & Hovick, 2017; Hovick, 2013). Very few studies included specific scenarios for both positive and negative outcomes, and the measurement of coping efficacy was new to this

study. While a higher order factor could not be identified, it is still notable that coping efficacy was included in the measurement models of this analysis alongside outcome assessments instead of the other forms of efficacy. Past studies have often dropped coping efficacy, due to poor fit (Hovick, 2013). Coping efficacy had a better fit with outcome assessments than efficacy assessment in the model, and this may suggest a new way to conceptualize coping efficacy in future work.

In the final structural model for pharmacists, positive outcome assessments (standardized residual 0.472 (0.099)), negative outcome assessments (standardized residual 0.315 (0.074)), and coping efficacy (standardized residual -0.187 (0.077)) were significantly related to information seeking. Negative outcome assessments (standardized residual -0.250 (0.072)), and coping efficacy (standardized residual -0.213 (0.097)) were also significantly related to information avoidance in this model.

Positive outcome assessments were related to information seeking as predicted, but not to information avoidance. Information avoidance has not been previously studied in any context related to medications or pharmacists. Negative outcome assessments performed as expected positively predicting information seeing and negatively predicting information avoidance. However, coping efficacy negatively predicted both information seeking and information avoidance. This indicates that improving patient perceptions of their ability to cope with the negative effects of information seeking may lead to less information avoidance, but also less information seeking from a pharmacist. More research is needed to further explore these unexpected results.

5.2.5 Hypothesis 1.5

Hypothesis 1.5 was to examine if the linear combination of communication efficacy and target efficacy would be positively correlated with active medication information-seeking and negatively correlated with avoidance. A higher order factor was not identifiable in structural equation modeling, resulting in the addition of individual constructs to the model. Although at least one past study in the healthcare context has been able to produce a higher order factor (Rauscher & Hesse, 2014), a majority of studies in the healthcare context have utilized individual predictors (Carter et al., 2012a, 2013a, 2013b; Checton et al., 2012; DeLorme et al., 2011; Fowler & Afifi, 2011; Hovick, 2013; Huston, 2013; Lewis & Martinez, 2014; Rauscher & Hesse, 2014;

Wong, 2014). The 2020 meta-analysis of TMIM studies was not able to identify a higher order factor for efficacy (Kuang & Wilson, 2020). Future studies in this context may consider adapting the model to remove high order factors (see Figure 1), however this adds complexity to the model that will require larger sample sizes.

In the final structural model for pharmacists, communication efficacy and target efficacy did not have a direct, significant effect on information seeking or information avoidance. Communication efficacy and target efficacy did have an indirect effect on information seeking and avoidance in the pharmacist model. This is a major deviation from the original theory which predicts that efficacy would have direct effects on information management, while outcome assessments have an indirect effect on information management through their effect on efficacy.

In this study, outcome assessments and coping efficacy had a direct effect on information management behaviors, while communication and target efficacy did not. This differs from past studies, especially in terms of communication efficacy, which has consistently performed as a direct predictor of information seeking (Kuang & Wilson, 2020). Personal efficacy for communication may not be enough to overcome concerns about negative expected outcomes of information seeking in community pharmacy settings. Patients' perceptions of the outcomes of information seeking and ability to cope with these outcomes were direct predictors of information seeking rather than efficacy assessments.

5.2.6 Hypothesis 1.6

Hypothesis 1.6 was to examine if older adults' outcome assessments would be positively correlated with their efficacy assessments. Negative outcome assessments did not have a direct, significant effect on communication or target efficacy in the pharmacist model. Positive outcome assessments had a direct significant effect on target efficacy (standardized residual 0.440 (0.082)), but not communication efficacy. Future structural models may want to explore alternate methods of assessing the relationship between outcome and efficacy assessments, especially in contexts where outcome assessments are strong predictors of information management behaviors. Testing the direct effect of outcome assessments, but only the indirect effect of efficacy assessments would decrease the overall number of paths and complexity of future models (see Figure 5.1).

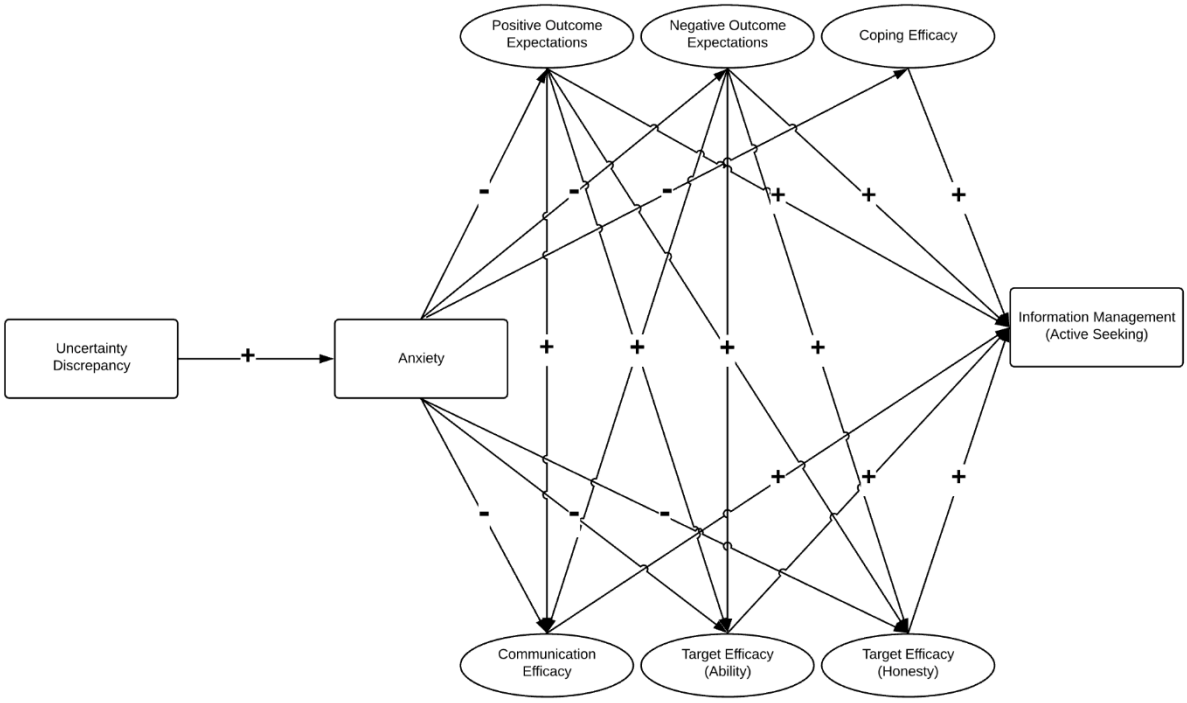

Figure 5.1. Removing Higher Order Factors from Future Structural Models

5.2.7 Hypothesis 1.7

Hypothesis 1.7 was to examine if older adult's efficacy assessments (communication efficacy and target efficacy) would mediate the association between anxiety about uncertainty discrepancy and medication information-seeking behaviors. Mediation requires significant associations between the independent variable and outcome variable and the independent variable and mediator variable. The mediator must also be significantly associated with the outcome variable. When a path is added between the mediator variable and the outcome variable the relationship between the independent variable and the outcome variable should decrease (Baron & Kenny 1986).

Anxiety was the mediator variable, and the outcome variable was information seeking. The independent variables were communication efficacy and target efficacy. Communication efficacy and target efficacy were not statistically significantly related to the outcome variable (information seeking). Anxiety (the mediator variable) was significantly related to communication efficacy, but

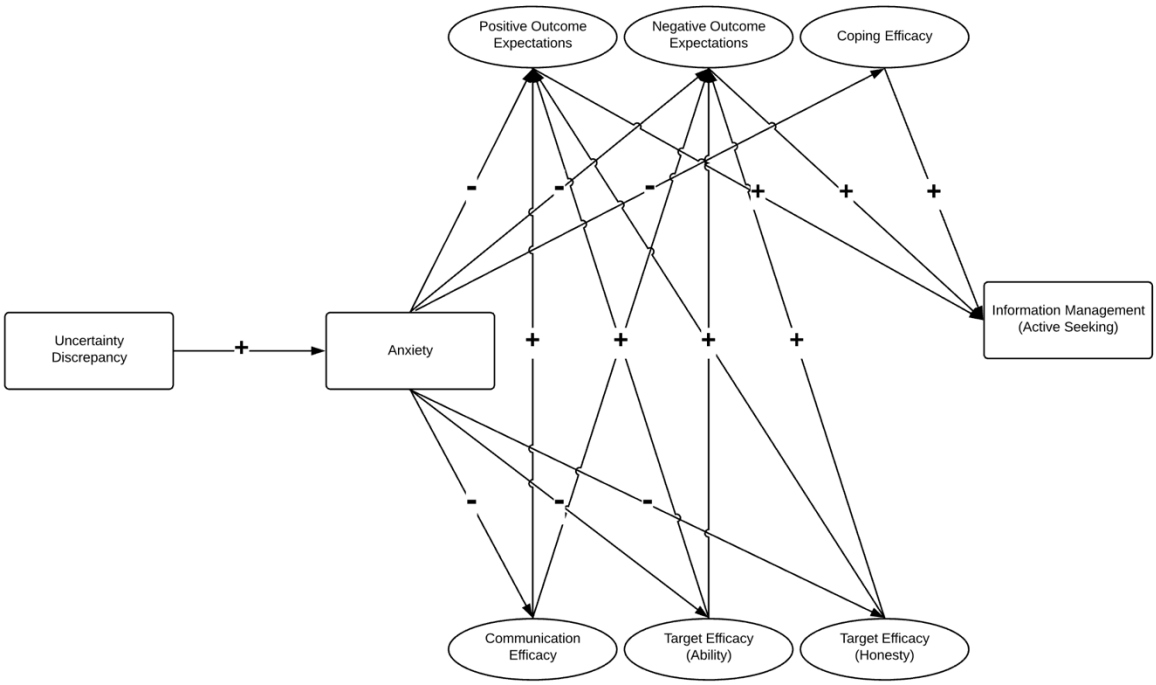

Figure 5.2. Reversing the Direction of the Relationship between Efficacy and Outcome Assessments

not target efficacy. Because none of the complete mediation paths were statistically significant, the alternate mediation model was not tested.

5.3 Discussion of Aim 2 Results

The second aim of the study was to characterize the relationship between medication information seeking at refill dispensing and medication outcomes. Results of each hypotheses related to aim two are discussed below.

5.3.1 Hypothesis 2.1

Hypothesis 2.1 was to examine if older adults who sought medication information during dispensing would have higher levels of medication knowledge at the end of the study period, when compared to those participants who do not seek medication information. Baseline knowledge scores accounted for 60.1% of the variance in final knowledge scores. Information seeking at refill

dispensing, information seeking after refill dispensing, and the effect of the intervention accounted for 21.8% of the remaining variance in final medication knowledge scores. After adjusting for baseline knowledge scores, information seeking at refill dispensing was a significant predictor of medication knowledge at the end of the study period. Information seeking "at home" after dispensing and the impact of the study intervention were not statistically significant predictors of final medication knowledge scores, after adjusting for baseline knowledge.

Although a significant amount of past literature suggests that pharmacists have an impact on a variety of medication outcomes (Pickard & Hung, 2006; Robertson et al., 2010; Roughead et al., 2005; Taitel et al., 2012; Wu et al., 2006; Wubben & Vivian, 2008), this is the first study to test the impact of routine pharmacist counseling on medication knowledge. By targeting the patients or information seekers, this study provides evidence of the real-world effect of pharmacist counseling without any training, intervention, or contact with the pharmacies or pharmacists that provided the counseling.

This is especially relevant due to the timing of the counseling at refill. The results of this study suggest that patient knowledge deficits continue well beyond the initial fill of the medication. Older adults that had been taking their medications for up to 3 months prior to the beginning of the study still had significant knowledge deficits at baseline. Even with the knowledge improvement after pharmacist counseling at refill, a majority of participants continued to have inadequate overall medication knowledge scores. This may be due to the comprehensive nature of the medication knowledge instrument and scoring rubric utilized in this study. More comprehensive measurement tools are more likely to expose greater knowledge deficits than the more limited measurements utilized in past studies. It may also be due to the limited amount of time pharmacists and participants spent discussing medications. Pharmacists spend less than a minute counseling a majority of community pharmacy patients (Krska, 2011; Young, 1996). These limited education sessions may be enough to impact medication knowledge, but not overcome older adults' large, sustained gaps in medication knowledge.

5.3.2 Hypothesis 2.2

Hypothesis 2.2 was to examine if participants who sought medication information during dispensing would have more persistent information recall, when compared to those participants who do not seek medication information. Half of the participants that did not seek information at

refill dispensing lost medication knowledge over the study period, while 30% of those who did seek information at refill medication lost medication knowledge. Only 36.9% of participants who did not seek information gained knowledge (13.1% retained knowledge), while 70% of participants who sought information at refill gained medication knowledge. Those that did not seek information from a pharmacist at the time of refill were 4 times less likely to gain medication information over the course of the study period.

These results suggest that older adults' have significant information deficits even after the initial prescribing and dispensing of a new medication. Older adults are also at risk for knowledge loss over the course prescription use. Receiving additional information from a pharmacist at the time of refill may be protective against this information loss, and even increase the chance of gaining medication knowledge. Because pharmacists are less likely to counsel on a refill than initial fill of a medication, patients may be required to initiate conversations at medication refill (Guirguis, 2011a, Krueger 2011, Britten, 2009).

5.3.3 Hypothesis 1.3

Hypothesis 1.3 was to examine if participants who sought medication information during dispensing would have higher necessity beliefs and lower concern beliefs about their medication, when compared to those participants who did not seek medication information. Information seeking was not statistically significantly related to necessity or concern beliefs.

These results, while contrary to the initial hypothesis, could be expected in the context of current counseling practices in community pharmacies. Pharmacists focus on facts and information provision during medication counseling (Ascione et al., 1985b; Gerwing et al., 2016; Puspitasari et al., 2009). Medication knowledge is required for the safe use of medications, but it does not guarantee that patients will choose to adhere to medication regimens. For example, a patient's concerns about the risks of a medication may discourage the use of that medication even when correct "knowledge" of side effects is obtained. Medication beliefs remain an important target for other outcomes such as medication adherence (Bae et al., 2016; Cicolini et al., 2016; Dillon, Phillips, et al., 2018; Dillon, Smith, et al., 2018; Fawzi et al., 2012; McLoughlin et al., 2019; Rajpura & Nayak, 2014; Ruppar et al., 2012; Schüz et al., 2011a; Sirey et al., 2013; E. Unni et al., 2015; E. J. Unni & Farris, 2011). These results suggest that medication counseling in its current form is likely not sufficient to change an individual's beliefs about medication counseling. The

primary method that pharmacists in North America are taught to utilize while counseling patients is the “three prime questions” (Dyck, Deschamps, & Taylor, 2005). These questions include:

- "What did your doctor tell you the medication is for?"
- "How did your doctor tell you to take the medication?," and
- "What did your doctor tell you to expect?"

While these questions have advantages (e.g. all three are open ended in nature), it is notable that these questions revolve around reiterating what the doctor has said, and not eliciting the patient perspective about the medication. These questions have proven effective in one past study to increase knowledge, however their impact on beliefs are not known (Guirguis, 2011b). If medication beliefs are to be targeted during pharmacist counseling, changes may need to be made in how counseling student and practicing pharmacists are taught to counsel patients about their medications. Pharmacists are the last healthcare professional to interact with a patient before a patient goes home and makes the most impactful decision of all in terms of treatment: whether or not to take the medication as prescribed. A patient-centered approach to counseling such as motivational interviewing, or “ method of guiding to elicit and strengthen personal motivation for change” may be particularly useful in helping patients overcome ambivalence about medications (Resnicow, 2012).

5.3.4 Hypothesis 1.4

Hypothesis 1.4 was to examine if participants who seek medication information at the time of dispensing would have higher communication and target efficacy scores for pharmacists at the end of the study period, when compared to those participants who do not seek medication information.

Baseline communication efficacy accounted for 76.9% of the variance in final communication efficacy. Because the analysis was completed as a hierarchical regression, this percentage should be assessed in comparison the remaining available variance after the effect baseline communication efficacy. Information seeking at refill dispensing, information seeking after refill dispensing, and the effect of the intervention accounted for 28.1% of the remaining variance (6.5% of the total variance) in final communication efficacy. After adjusting for baseline communication efficacy, information seeking at refill dispensing was a significant predictor of communication efficacy at the end of the study period. Information seeking after dispensing and

the impact of the study intervention were not significant predictors of final communication efficacy after adjusting for baseline knowledge.

Baseline target efficacy accounted for 79.0% of the variance in final target efficacy. Information seeking at refill dispensing and the effect of the intervention accounted for 8.6% of the remaining variance in final target efficacy. After adjusting for baseline target efficacy, information seeking at refill dispensing was not a significant predictor of target efficacy at the end of the study period. However, the impact of the study intervention was a statistically significant predictor of final target efficacy after adjusting for baseline target efficacy.

Information seeking was significantly related to changes in communication efficacy, while the intervention was significantly related to changes in target efficacy. Target efficacy was the only outcome to be significantly related to the effect of the intervention alone. These results suggest that beyond encouraging an increased number of participants to seek information from a pharmacist, the education sheet and pocket card provided to patients also positively impacted the perceptions of honest, availability, and ability.

Seeking information from a pharmacist positively increases participants' perceptions of their ability to seek information from and communicate with pharmacists. In past studies, communication efficacy has been one of the strongest predictors of future intention to seek information (Carter, 2015). Increasing communication efficacy may in turn, increase future information seeking from pharmacists. Overall, these results suggest that attitudes about information seeking may be suitable targets for interventions and also impacted by the act and results of information seeking behaviors. This is the first known study to target these attitudes as outcomes or study the potential influence of information seeking of changes in these attitudes.

5.4 Strengths and Limitations

Project PROMISE was conducted in a single specialty clinic using convenience sampling. This may limit the generalizability of the results to other settings; however, the clinic was specifically selected due to the large numbers of physicians that shared the practice site. This allowed for data to be collected for prescriptions from multiple prescribers while maintaining feasibility by restricting in-person recruitment to a single location. One of the primary strengths of the study is the longitudinal prospective data collection. The demographics of the sample,

especially the large percentage of Black African American participants, addressed a major gap in past communication and health literature.

This study was originally designed to test the impact of information seeking on the knowledge of a new prescription that was prescribed on the day of the consent. Unfortunately, the number of new prescriptions the physicians were prescribing was significantly less than what was initially estimated. Many of these participants were visiting the specialty clinic to assist with the management of polypharmacy, and therefore there were likely less new chronic medications in this population than other general populations. Many patients had recently been prescribed medications, or had their medications changed or discontinued. However, new chronic medications during an office visit were rare.

Due to the difficulties in recruitment, the inclusion criteria were altered to change the definition of a new prescription. Instead of defining a new prescription as a prescription that was prescribed the same day as consent, this definition was expanded to any prescription started within the last three months. New medications included medications that subjects were already taking, but had been taking less than three months. If multiple medications were prescribed within the last three months, the most recently prescribed medication was chosen for the study.

One potential concern of this adjustment was that knowledge would be higher at baseline for participants that had already been taking medications, than it would be for those who were newly prescribed medications at the start of the study. However, Project PROMISE found knowledge deficits at baseline, and suggests that knowledge may decrease over time. Therefore, knowledge may have been worse at baseline in our sample, than it had been if we had only included prescriptions prescribed at the time of consent.

In the original study design, participants in the intervention group would have likely been visiting the pharmacy on the day they received the intervention. Once new medication was re-defined, baseline data collection asked them to recall past encounters with pharmacy staff. Therefore, some participants may have forgotten their conversations with the pharmacist or forgotten information about their medication before the assessment. Anecdotally, participants were able to recall and provide details about past encounters with the pharmacist without difficulty. In addition, it is likely there were more “defiers” in the sample, than we would have had the intervention and seeking occurred on the same day. However, these results gave a more naturalistic assessment of the intervention itself.

Even after adjusting for the definition of a new prescription, recruitment of 132 participants took 27 months. This was partially due to inclusion criteria eliminating all patients receiving acute medications, relying on caregivers, utilizing mail order pharmacies, or receiving 90-day prescriptions. Specifically, the requirement that all patients could not have a formal or informal caregiver as the primary manager their medications led to many patients being excluded from the study. Those that rely on a caregiver may have lower knowledge than the population presented here due to their reliance on outside individuals to manage their medications. Finally, delays in recruitment were also due to limited resources, requiring all in-person consenting and telephone follow-ups to be completed by a single researcher.

There may be unknown confounding factors that influenced medication knowledge, medication beliefs, and information seeking behaviors due to the naturalistic setting of the study. However, the naturalistic setting increases external validity, and also allowed for the measurement of outcomes before and after seeking information from a pharmacist. The naturalistic setting also allowed for the first known assessment of the 'real-world' outcomes of routine medication counseling in the community pharmacy setting. Project PROMISE also provides data in an understudied population in terms of both age and race. However, the population may not be generalizable to the entire older adult population, especially to a male population.

The attitudes about medication information seeking instrument was adapted from past studies. The scenarios for positive and negative outcome assessments, as well as coping efficacy were newly developed for this context. Therefore, additional positive and negative outcomes of information seeking may influence patients' information seeking behaviors that were not accounted for in this study.

5.5 Future Research

A data set for this project includes 284 unique variables for each participant, and there are many potential secondary analyses that were outside the scope of the initial hypotheses. Data collected about new medications could be utilized to compare medication knowledge to medication class or medication complexity. Medication knowledge and beliefs could also be compared to medication adherence data that was collected at baseline and month one.

Model fit was only assessed using baseline data. Data collected at month one could be utilized to create additional structural models, accounting for the change in attitudes over time.

Current structural equation models also use a traditional definition of uncertainty discrepancy. However, alternate models for actual uncertainty and desired uncertainty could also be analyzed with the current data set. In addition, the 2020 meta-analysis suggested that issue importance may have an expanded role in analysis beyond a scope condition. Issue importance should be considered as a moderator of all paths in the TMIM model.

In addition, Project PROMISE utilized patient report of past information seeking behaviors over the last six months, as the measurement for information management behaviors. The data set also provides prospective data on information seeking at baseline and month one. Additional alternate models could be produced to compare the validity of the model with different conceptualizations of information seeking. The primary analysis focused on two specific MIMB: direct information seeking and information avoidance. This data set also includes questions specific to indirect information seeking that could be analyzed as another potential outcome variable of information seeking attitudes.

The results of this study provide preliminary data for the utilization of the TMIM in the context of medication information seeking from both pharmacists and physicians. The models could be expanded with larger data sets and a full set of TMIM variables for physicians. Future studies may consider the information provider by including data from healthcare providers, including pharmacists and physicians as a part of the model. Information seekers and providers would ideally be studied in dyads to analyze the two-way impact of seekers and providers. Studies focused on the pharmacy context should operationalize medication counseling as a two-way exchange between pharmacists and patients.

Future work could build on and utilize comprehensive, clinically-based assessments of medication knowledge. In addition, comprehensive assessments of medication knowledge could be studied, in conjunction with other important clinical outcomes such as: medication adherence, readmissions, morbidity, and mortality. Additional clarity is needed regarding the role of caregivers in these knowledge assessments, and how reliance on formal and informal caregivers may influence the clinical impact of medication knowledge deficits. Until definitive data can explain which domains of medication knowledge lead to an impact on medication and clinical outcomes, assessments should not exclude domains of knowledge that have been determined to be important by clinical experts.

Finally, while a majority of past work focused on information providers, Project PROMISE results suggest that information seekers may be useful targets of research and intervention. More focus and attention needs to be shifted to providing useful information to patients, not just at initial prescribing and dispensing, but also during refill and monitoring.

5.6 Conclusion

Project PROMISE was a longitudinal study measuring information seeking behaviors and medication outcomes of a sample of 132 older adults during a one-month period of taking a new chronic medication. Patients were more likely to report seeking information from pharmacists and physicians than the internet or friends and family in the 6 months period before baseline. While a majority of participants reported asking their pharmacist a question over the previous 6 months, a majority also reported avoiding asking a question that they wanted or needed to ask. Overall, the theory of motivated information management was a good fit for predicting information management behaviors in this population. Patients' perceptions of the positive and negative outcomes of seeking information from pharmacists and their ability to cope with these outcomes are direct, significant predictors of information seeking and information avoidance.

Over 90% of participants had insufficient medication knowledge at baseline and 44% of those participants lost medication knowledge over the course of the month-long study. Older adults are at risk for deficits in medication knowledge and loss of medication knowledge over time. Seeking information from a pharmacist may have a protective effect against knowledge loss, and even lead to knowledge gain. Those that sought information at medication refill were 4 times more likely to gain medication knowledge from baseline to completion of the study. Seeking information from a pharmacist at refill also improved participants' perceptions of their ability to communication with pharmacists which may improve intentions to seek additional information in the future. Clinical interventions and research could give more attention to continued education after the initial fill of a medication, specifically focusing on medication counselling at refill dispensing.

An intervention including a pocket card giving patients specific questions to ask the pharmacist at refill and a one-page education tool about the role of a pharmacist increased patient's information seeking at refill and their perceptions of the availability of pharmacists to provide medication information. Information seekers may provide ideal targets for future interventions.

5.7 Notes

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Wu, J. Y. F., Leung, W. Y. S., Chang, S., Lee, B., Zee, B., Tong, P. C. Y., & Chan, J. C. N. (2006). Effectiveness of telephone counselling by a pharmacist in reducing mortality in patients receiving polypharmacy: randomised controlled trial. *BMJ*, *333*(7567), 522. https://doi.org/10.1136/bmj.38905.447118.2f

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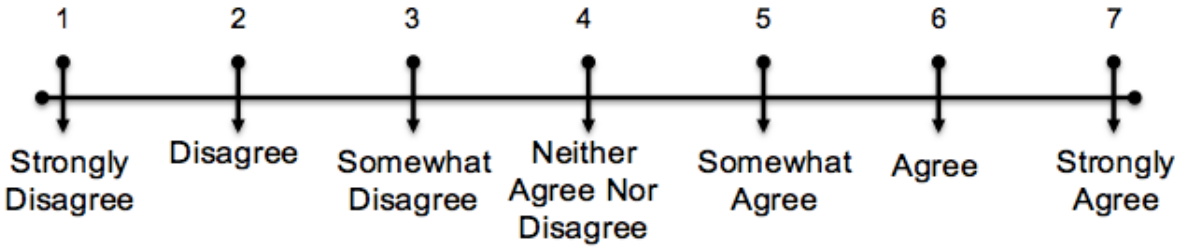
APPENDIX A. SURVEY INSTRUMENTS

Attitudes About Seeking Medication Information Instrument

The purpose of this survey is to explore your attitudes about seeking information related to your medications. Some of the questions may be difficult to answer, but please answer them to the best of your ability. Know that your answers will remain anonymous, and will not be shared with ANY of your healthcare providers or with anyone else, so be as honest as possible with your responses.

First, I will read statements that may or may not represent how you feel about your health and your medications. For each statement that I read, you are given 7 answer choices that represent how strongly you disagree or agree with the statements. The answer choices are: strongly disagree, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree, or strongly agree. These answer choices are shown on Scale 1 below. Choose the answer choice that best represents your level of agreement with each statement that I read aloud.

Scale 1:



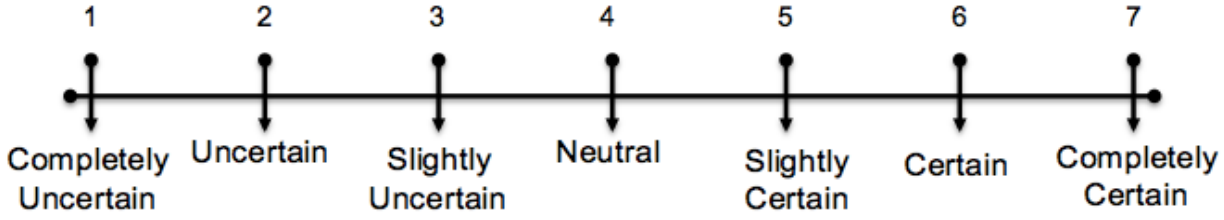
	SD			N			SA
It is important to me that I know about my medications	1	2	3	4	5	6	7
Information about my medications is important to me right now.	1	2	3	4	5	6	7
It worries me when I compare how little I know about my medications to how much I want to know.	1	2	3	4	5	6	7
It makes me anxious to think about difference between how much I want to know about my medications and how much I actually know.	1	2	3	4	5	6	7

	SD			N			SA
It is important to me that I talk with a pharmacist about my medications.	1	2	3	4	5	6	7
I know what to say to get information about my medications from a pharmacist.	1	2	3	4	5	6	7
I know what questions to ask a pharmacist about my medications.	1	2	3	4	5	6	7
I am confident I can approach a pharmacist to talk about my medications.	1	2	3	4	5	6	7
A pharmacist would be completely honest about my medications.	1	2	3	4	5	6	7
A pharmacist would tell me everything they know about my medications.	1	2	3	4	5	6	7
A pharmacist is available to talk to me about my medications.	1	2	3	4	5	6	7
A pharmacist typically wants to talk to me about my medications.	1	2	3	4	5	6	7
A pharmacist has the time to talk to me about my medications.	1	2	3	4	5	6	7
A pharmacist can provide me with the information I want about my medications.	1	2	3	4	5	6	7
A pharmacist has complete information about medications.	1	2	3	4	5	6	7
It is important to me that I talk with a doctor about my medications.	1	2	3	4	5	6	7
I know what to say to get information about my medications from a doctor.	1	2	3	4	5	6	7
I know what questions to ask a doctor about my medications.	1	2	3	4	5	6	7
I am confident I can approach a doctor to talk about my medications.	1	2	3	4	5	6	7
A doctor would be completely honest about my medications.	1	2	3	4	5	6	7
A doctor would tell me everything they know about my medications.	1	2	3	4	5	6	7
A doctor is available to talk to me about my medications.	1	2	3	4	5	6	7

	SD			N			SA
A doctor typically wants to talk to me about my medications.	1	2	3	4	5	6	7
A doctor has the time to talk to me about my medications.	1	2	3	4	5	6	7
A doctor can provide me with the information I want about my medications.	1	2	3	4	5	6	7
A doctor has complete information about medications.	1	2	3	4	5	6	7

Next I will read several more statements that may or may not represent your level of certainty about your health and your medications. For each statement that I read, you are given 7 answer choices that represent how CERTAIN you are about the statement. The answer choices are: completely uncertain, uncertain, slightly uncertain, neutral, slightly certain, certain, and completely certain. These answer choices are shown on Scale 2 below. Choose the answer choice that best represents your level of certainty with each statement that I read aloud.

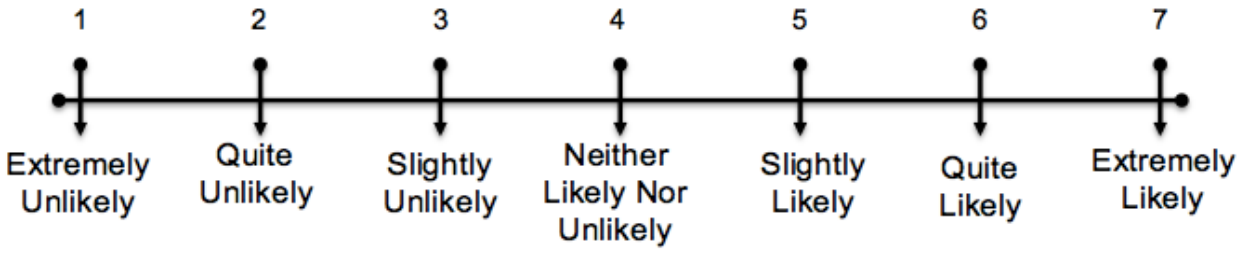
Scale 2:



	CU			N			CC
Overall, **how certain are you** that you know everything you need to know about your medications?	1	2	3	4	5	6	7
Overall, **how certain do you want to be** that you know everything you need to know about your medications?	1	2	3	4	5	6	7

Next I will read several more statements that may represent situations that you encounter in healthcare. For each statement that I read, you are given 7 answer choices that how likely you think the situation is to occur. The answer choices are: extremely unlikely, quite unlikely, slightly unlikely, neither, slightly likely, quite likely, and extremely likely. These answer choices are shown on Scale 3 below. Choose the answer choice that best represents your opinion with each statement that I read aloud.

Scale 3:



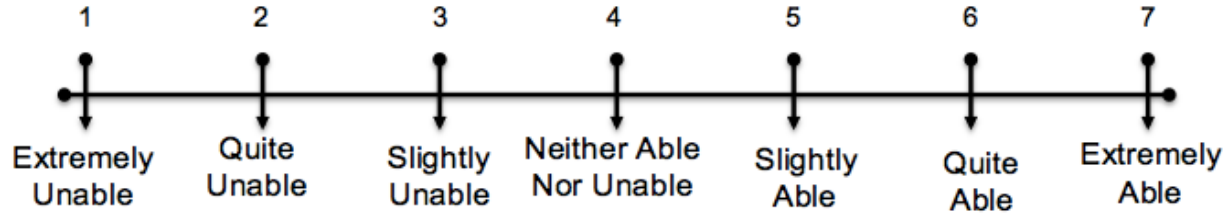
	EU			N			EL
If I ask the pharmacist about my medications, I will gain information about the risks of my medication.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, other patients that are waiting will get upset.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, I will gain information about the benefits of my medication.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, he/she will think that I am uneducated.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, I will gain information about how to take my medication.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, the information I receive will be overwhelming.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, I will gain information about the cost of my medication.	1	2	3	4	5	6	7

If I ask the pharmacist about my medications, I will not understand the information they provide to me.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, my knowledge of my medications will increase.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, I will have to spend a longer amount of time in the pharmacy.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, my confidence in managing my medication will increase.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, I will feel uneducated.	1	2	3	4	5	6	7
If I ask my pharmacist about my medications, it will be more likely that I will receive the correct medication.	1	2	3	4	5	6	7
If I ask the pharmacist about my medications, it will remind me that I am sick or unwell.	1	2	3	4	5	6	7
If I ask the doctor about my medications, I will gain information about the risks of my medication.	1	2	3	4	5	6	7
If I ask the doctor about my medications, other patients that are waiting will get upset.	1	2	3	4	5	6	7
If I ask the doctor about my medications, I will gain information about the benefits of my medication.	1	2	3	4	5	6	7
If I ask the doctor about my medications, he/she will think that I am uneducated.	1	2	3	4	5	6	7
If I ask the doctor about my medications, I will gain information about how to take my medication.	1	2	3	4	5	6	7
If I ask the doctor about my medications, the information I receive will be overwhelming.	1	2	3	4	5	6	7
If I ask the doctor about my medications, I will gain information about the cost of my medication.	1	2	3	4	5	6	7
If I ask the doctor about my medications, I will not understand the information they provide to me.	1	2	3	4	5	6	7

If I ask the doctor about my medications, my knowledge of my medications will increase.	1	2	3	4	5	6	7
If I ask the doctor about my medications, I will have to spend a longer amount of time in the physician's office.	1	2	3	4	5	6	7
If I ask the doctor about my medications, my confidence in managing my medication will increase.	1	2	3	4	5	6	7
If I ask the doctor about my medications, I will feel uneducated.	1	2	3	4	5	6	7
If I ask my doctor about my medications, it will be less likely that I will receive the incorrect medication.	1	2	3	4	5	6	7
If I ask the doctor about my medications, it will remind me that I am sick or unwell.	1	2	3	4	5	6	7

Next I will read several more statements that may represent situations that you encounter in healthcare. For each statement that I read, you are given 7 answer choices that represent your ability to cope with the situation. The answer choices are: extremely unable, quite unable, slightly unable, neither able nor unable, slightly able, quite able, and extremely able. These answer choices are shown on Scale 4 below. Choose the answer choice that best represents your opinion with each statement that I read aloud.

Scale 5:



	EU			N			EA
If other patients that are waiting get upset, how able to cope are with this situation are you?	1	2	3	4	5	6	7
If you gain information about the benefits of my medication, how able to cope with this information are you?	1	2	3	4	5	6	7

	EU			N			EA
If you feel that the pharmacist or doctor thinks that you are uneducated, how able to cope with this situation are you?	1	2	3	4	5	6	7
If you gain information about how to take my medication, how able to cope with this information are you?	1	2	3	4	5	6	7
If you are overwhelmed by the information you receive about you medication, how able to cope with this situation are you?	1	2	3	4	5	6	7
If you gain information about the cost of my medication, how able to cope with this information are you?	1	2	3	4	5	6	7
If you do not understand the information provided to you about your medication, how able to cope with this situation are you?	1	2	3	4	5	6	7
If you increase your knowledge of your medications, how able to cope with this situation are you?	1	2	3	4	5	6	7
If you have to spend a longer amount of time in the pharmacy or physician's office, how able to cope with this situation are you?	1	2	3	4	5	6	7
If you increase your confidence in managing your medications, how able to cope with this situation are you?	1	2	3	4	5	6	7
If you feeling uneducated, how able to cope with this situation are you?	1	2	3	4	5	6	7
If you receive the incorrect medication, how able to cope with this situation are you?	1	2	3	4	5	6	7
If you are reminded that you are sick or unwell, how able to cope with this situation are you?	1	2	3	4	5	6	7

Finally, I will ask you about actions you have taken in the last six months. Your answer choices are never, rarely, occasionally, sometimes, frequently, usually, and every time. Please answer as honestly as possible, as there are no right or wrong answers.

	N			S			ET
Asked a pharmacist questions about my medications	1	2	3	4	5	6	7
Avoided asking a pharmacist questions about my medications, even though I wanted or needed to ask a question	1	2	3	4	5	6	7

	N			S			ET
Talked to a pharmacist in hopes that they would answer my questions about my medications without me asking	1	2	3	4	5	6	7
Asked a friend or family member questions about my medications	1	2	3	4	5	6	7
Searched the internet for answers to questions about my medications	1	2	3	4	5	6	7
Asked a doctor questions about my medications	1	2	3	4	5	6	7
Avoided asking a doctor questions about my medications, even though I wanted or needed to ask a question	1	2	3	4	5	6	7
Talked to a doctor in hopes that they would answer my questions about my medications without me asking	1	2	3	4	5	6	7

Demographics Instrument

We are now finished with the main part of the survey. Before I let you go, I will ask you a few questions about your demographics. Again, be assured that this information will remain completely anonymous, and will only be used to identify trends.

I am:

- o Male
- o Female

My age is: _____

Are you of Hispanic, Latino, or Spanish origin?

- o Yes
- o No

Which of the following categories best describes your ethnicity?

- o American Indian or Alaska Native
- o Black or African American
- o Native Hawaiian or other Pacific Islander
- o Asian
- o White/ Caucasian
- o Other, please specify _____

What is the highest level of school you have completed or the highest degree you have received?

- o Less than high school degree
- o High school degree or equivalent (e.g., GED)
- o Some college but no degree
- o Associate degree
- o Bachelor degree
- o Graduate degree

Do you ever forget to take your medicine?

- o Yes
- o No

Are you careless at times about taking your medicine?

- o Yes
- o No

Sometimes if you feel worse when you take your medicine do you stop taking it?

- o Yes
- o No

When you feel better do you sometimes stop taking your medicine?

- o Yes
- o No

How confident are you filling out medical forms by yourself?

- o Extremely
- o Quite a bit
- o Somewhat
- o A little bit
- o Not at all

Knowledge About New Chronic Medication Instrument

The first part of this survey asks questions about the medication that the doctor prescribed to you today. Some of the questions may be difficult to answer, and you may not be able to answer every question. Just answer each question as fully and completely as possible to the best of your abilities. Know that your answers will remain anonymous, and will not be shared with ANY or your healthcare providers or with anyone else, so be as honest as possible with your responses.

1. What is the name of your new medicine?

2. Why are you taking your new medicine or what is it used for?

3. How and when should you take your new medicine, and for how long?

4. What side effects should you expect from your new medicine, and what should you do about them?

5. Should you take your new medicine on an empty stomach or with food?

6. Should you avoid any activities, foods, drinks, alcohol, or other medicines while taking your new medicine?

7. What is the best time of day to take your new medication?

8. Will your new medicine work safely with any other medicines you are taking, including over-the-counter medicines?

9. When should you expect your new medicine to begin to work, and how will you know if it's working?

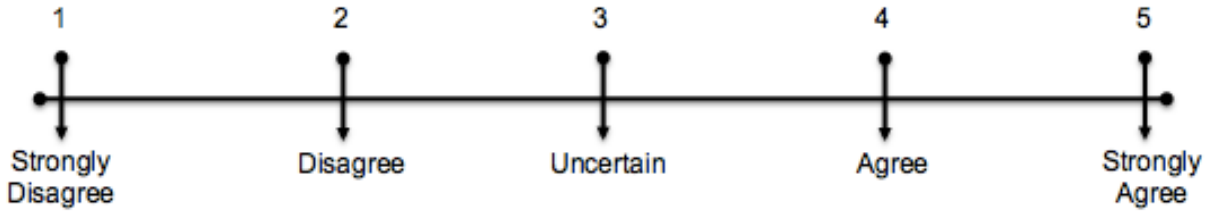
10. How should you store your new medicine?

Beliefs About Medicines Instrument

The purpose of the second part of this survey is to explore your beliefs about medication. Some of the questions may be difficult to answer, but please answer them to the best of your ability. Know that your answers will remain anonymous, and will not be shared with ANY or your healthcare providers or with anyone else, so be as honest as possible with your responses.

I will read statements that may or may not represent how you feel about your health and your medications. For each statement that I read, you are given 7 answer choices that represent how strongly you disagree or agree with the statements. The answer choices are: strongly disagree, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree, or strongly agree. These answer choices are shown on Scale 1 below. Choose the answer choice that best represents your level of agreement with each statement that I read aloud.

Scale 1:



	SD		U		SA
Without my medicines I would be very ill.	1	2	3	4	5
My life would be impossible without my medicines.	1	2	3	4	5
My health in the future will depend on my medicines.	1	2	3	4	5
My medicines protect me from becoming worse.	1	2	3	4	5
I sometimes worry about becoming too dependent on my medicines.	1	2	3	4	5
My medicines disrupt my life.	1	2	3	4	5
These medicines give me unpleasant side effects.	1	2	3	4	5
Medicines do more harm than good.	1	2	3	4	5
My medicines disrupt my life.	1	2	3	4	5
All medicines are poisons.	1	2	3	4	5
Most medicines are addictive.	1	2	3	4	5

	SD		U		SA
People who take medicines should stop their treatment for a while every now and again.	1	2	3	4	5
Natural remedies are safer than medicines.	1	2	3	4	5
Doctors use too many medicines.	1	2	3	4	5
If doctors had more time with patients they would prescribe fewer medicines.	1	2	3	4	5
Doctors place too much trust on medicines.	1	2	3	4	5

Patient Contact Information Instrument

Finally, I need to collect some contact information for you so that we can do the follow-up surveys over the phone. The information you provide will be only used for the purpose of contacting you for the three follow-up surveys associated with this study, and will be deleted after your follow-ups are complete. The phone number will be stored on a secure research server, and will not be shared with anyone outside of the research staff.

Participant Name:

Participant Primary Phone Number:

Participant Secondary Phone Number:

Participant Address:

Participant Phone Number:

Medication Information Seeking and Administration Follow-up Instrument

1. Have you started taking your new medication? (Ask only if have not answered yes to this question at a previous follow-up)

2. If yes, Are you still taking your new medication?

3. If yes Skip to 4, if no- Why did you stop taking your medication?

4. Have you sought out or received any new information about your new medication since the last survey?

5. If yes, was this information from a personal source (such as a family member or friend), from a medical professional, or from another source such as paper literature or the Internet?

6. What specific information about your new medication did you receive from these sources?

Interaction with Pharmacy Staff Follow-up Instrument

The final part of this survey asks questions your interactions with the pharmacy staff when you picked up your medication. You may not remember every detail of your experience; just answer each question as fully and completely as possible to the best of your abilities. Know that your answers will remain anonymous, and will not be shared with ANY or your healthcare providers or with anyone else, so be as honest as possible with your responses.

Date new medication was prescribed:

Date of prescription pick up:

Did you talk to any pharmacy staff about your new medication when you picked it up?

If no, did you attempt to talk to any pharmacy staff about your medication? Did any pharmacy staff attempt to speak to you?

If yes, do you know if the person you spoke to was a pharmacist or other member of the team?

If spoke with a pharmacist, how long did you spend talking to a pharmacist?

If spoke with a pharmacist, who started the conversation? Did you ask to speak to the pharmacist or did the pharmacist approach you to speak to you without you asking?

If spoke with a pharmacist, what do you remember about what information was specifically given to you about the medication?

Demographic Follow-up Instrument

Do you ever forget to take your medicine?

- o Yes
- o No

Are you careless at times about taking your medicine?

- o Yes
- o No

Sometimes if you feel worse when you take your medicine do you stop taking it?

- o Yes
- o No

When you feel better do you sometimes stop taking your medicine?

- o Yes
- o No

How confident are you filling out medical forms by yourself?

- o Extremely
- o Quite a bit
- o Somewhat
- o A little bit
- o Not at all

Chart Abstraction Instrument

Patient Study ID:

Medication Name:

Medication Dose:

Medication Frequency:

Medication Usage Instructions:

Medication Refill Information:

APPENDIX B. INTERVENTION POCKET CARD

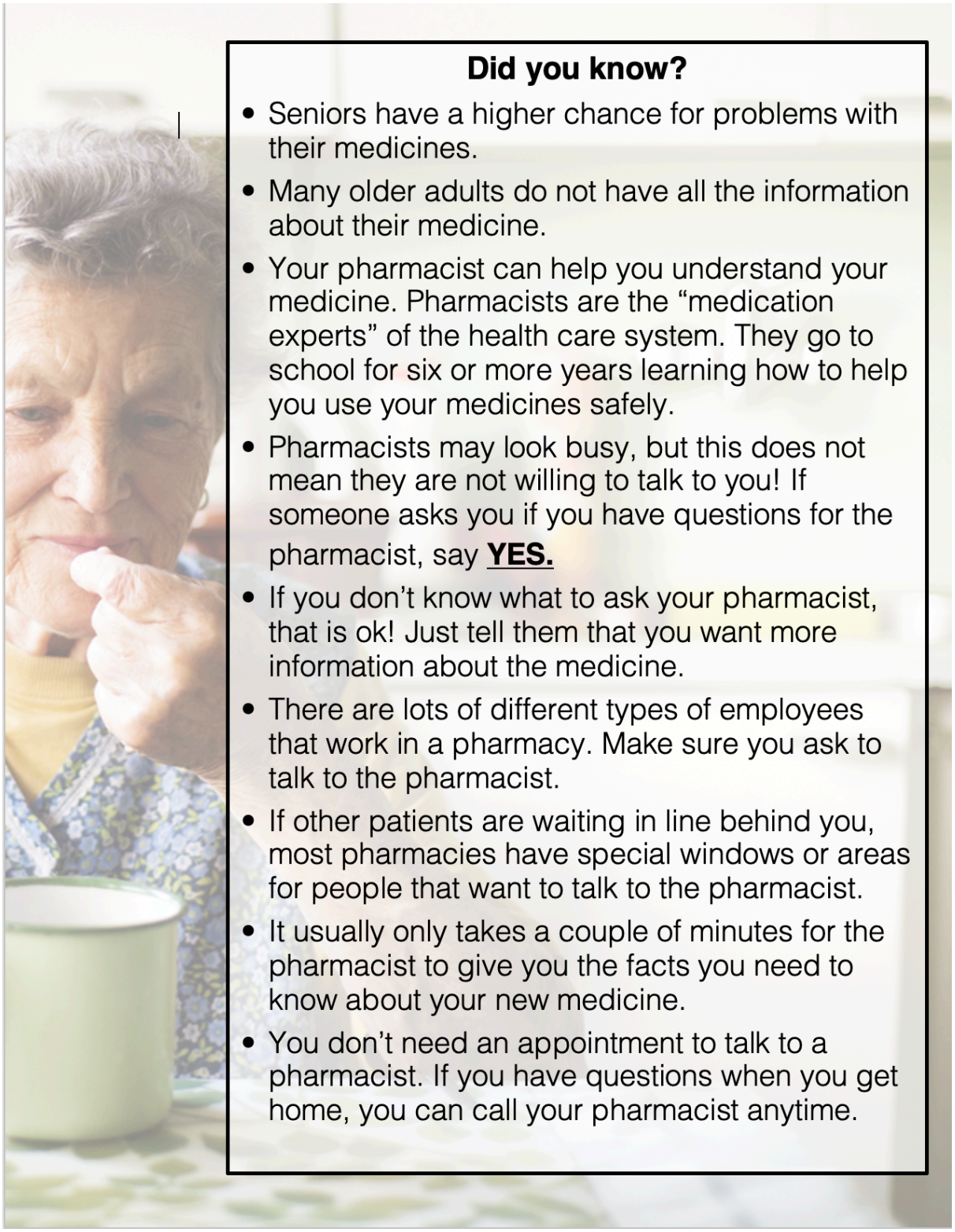
ASK YOUR PHARMACIST

1. What is this medication typically used for?

2. How should I take this medication?

3. What should I expect from this medication?

APPENDIX C. INTERVENTION EDUCATION SHEET



APPENDIX D. CONSENT FORM

Purdue IRB Protocol #: 1509016470 - Expires: 13-DEC-2021

RESEARCH PARTICIPANT CONSENT FORM

A Patient-Centered Perspective on Medication Counseling: Information Seeking and Outcomes Among an Elderly Population

Kimberly S. Plake
Pharmacy Practice
Purdue University

Key Information

Please take time to review this information carefully. This is a research study. Your participation in this study is voluntary which means that you may choose not to participate at any time without penalty or loss of benefits to which you are otherwise entitled. You may ask questions to the researchers about the study whenever you would like. If you decide to take part in the study, you will be asked to sign this form, be sure you understand what you will do and any possible risks or benefits.

- The goal of this study is to learn more about how you view your medications and where you get your information about medications.
- You will be a part of this study for 12 weeks.
- The biggest risk of this study would be questions that may make your feel uncomfortable. All questions are optional. As with all research projects the confidentiality of your information is also a risk that is being minimized as described below in this consent form.

What is the purpose of this study?

You are invited to participate in a research study to explore older adults beliefs and knowledge about medications, and seeking medication information. You were selected as a possible subject because you are 65 years of age or older and are taking at least one chronic, or on-going, prescription medication. This study will try to learn how to improve patient experience with medication use. We ask that you read this form and ask any questions you may have before agreeing to be in the study. You will receive a copy of this information to keep.

The study is being conducted by Dr. Kimberly S. Plake and Dr. Jaclyn R. Myers. Dr. Kimberly S. Plake and Dr. Jaclyn R. Myers are from Purdue College of Pharmacy. This study is funded by a grant from the Purdue University.

The purpose of this study is to learn more about how older adults view their prescription medication. As a part of this study we will ask you to fill out surveys regarding your beliefs about medications and your medication knowledge. We will also ask you questions about your opinions about seeking medication information.

If you agree to participate, you will be one of 350 participants who will be participating in this research.

What will I do if I choose to be in this study?

If you choose to be in this study, you will you will complete a 15-20 minute survey today in the physician's office. Then, you will be given specific instructions about picking up your prescription, and you will be contacted over the phone 3 times after you pick up your medication. You will be asked to answer questions over the phone within 48 hours of picking up your medication, 1 month after you pick up your medication, and 3 months after you pick up your medication.

You will also give consent to research staff to access your electron medical record to verify your medical diagnoses and your prescription information. This information will be entered directly into a secure research program that maximizes the safety of your personal information.

How long will I be in the study?

For the first portion of this study you will complete a survey that will take 15-20 minutes to complete. If you choose to continue in the study and you are eligible for the next phase, you will complete an addition 10-15 minutes of surveys today, and 10-15 minutes of phone surveys at each of the three follow-up sessions. You may be chosen to participate in an optional interview during follow-up that will take 30-45 minutes to complete.

What are the possible risks or discomforts?

Because you will complete surveys during this study, the biggest personal risk to you is that certain questions may make you feel discomfort or distress. If you are uncomfortable with any question on any of the surveys, you may choose to skip these questions.

With any research study, there is the risk of loss of confidentiality of your information. This study makes every effort to keep your information confidential by completing surveys orally, and not keeping any paper copies of any of your answers to the surveys. The same is true of your medical information obtained from your medical record. No written record of this information will ever be made, and electronic information will be stored on a secure server.

Are there any potential benefits?

Although you may not receive any direct benefits from participating in this study, future patients may benefit from the information you provide about your medication experiences. This study aims to collect information to improve communication between patients and medical professional about medications.

Will I receive payment or other incentive?

You will receive the following reimbursements in cash for your participation in this study:

- You will be compensated up to $35 cash for completion of this study:
  - $10 for completion of surveys today
  - $5 for completion of phone survey at Follow-up 1
  - $10 for each completion of phone survey at Follow-up 2 and 3

Will information about me and my participation be kept confidential?

The project's research records may be reviewed by departments at Purdue University responsible for regulatory and research oversight.

All survey data and personal information collected from you will be stored in secured electronic storage at Purdue University for the duration of the study analysis. This secure server is approved and in accordance with HIPPA privacy laws. All audio recordings, should you choose to participate in an interview, will be transcribed within 3 months of the interview. Recordings will be destroyed, and no identifiable information (such as your name) will be transcribed. The written transcripts will be kept indefinitely by the research staff on a secure in secured electronic storage at Purdue University. The only persons with access to identifiable research records will be the research staff from the study, and the data will never be used for further research or study without your written consent.

What are my rights if I take part in this study?

Your participation in this study is voluntary. You may choose not to participate or, if you agree to participate, you can withdraw your participation at any time without penalty or loss of benefits to which you are otherwise entitled. Choosing to withdraw participation from this study will not affect your medication treatments or relationships with any medical professionals in any way.

Who can I contact if I have questions about the study?

If you have questions, comments or concerns about this research project, you can talk to one of the researchers. Please contact Kimberly S. Plake, PhD at kplake@purdue.edu or 765-494-5966 or Jaclyn R. Myers at myers18@purdue.edu.

If you have questions about your rights while taking part in the study or have concerns about the treatment of research participants, please call the Human Research Protection Program at (765) 494-5942, email (irb@purdue.edu)or write to:

Human Research Protection Program - Purdue University
Ernest C. Young Hall, Room 1032
155 S. Grant St.,
West Lafayette, IN 47907-2114

Documentation of Informed Consent

I have had the opportunity to read this consent form and have the research study explained. I have had the opportunity to ask questions about the research study, and my questions have been answered. I am prepared to participate in the research study described above. I will be offered a copy of this consent form after I sign it.

_____ _____
Participant's Signature Date

_____
Participant's Name

_____ _____
Researcher's Signature Date

APPENDIX E. RUBRIC FEEDBACK AND ASSOCIATED CHANGES

Rubric Section	Feedback/ Comment	Comment Response	Response Justification
General Scoring Definitions Across All Categories			
Incorrect Answer One or more parts of the patient response do not match **OR** directly contradict the information provided in the actual prescription, the medication reference, or your own clinical expertise.	What is the medication reference? Package insert, patient information, online database (Micromedex/Lexicomp)? Could potentially define more clearly.	**Incorrect Answer** One or more parts of the patient response do not match **OR** directly contradict the information provided in the actual prescription, the provided medication reference, or your own clinical expertise.	Each grader is provided with the same medication reference-keeping the rubric as general as possible so that it can be utilized more broadly in the future.
Category-Specific Scoring Examples			
Name: No Answer N/A	Is this for "non-applicable" or "no answer?" Might be easier to interpret if it said something like "No answer" or "Patient did not address question" or "Patient indicated that they did not know the answer to this question"	See general definition above.	Clarified wording of category-specific examples, no examples needed for "no answer" category
Usage Instructions: Correct Answer To be scored as correct, the answer must state the correct frequency based on the prescription data. If the prescription frequency	Why is the route not required to be counted as a correct answer? Route is very important for the safe and correct use of medications. Unless this tool is being used only on PO medications (or generally across the	No changes.	Route was included in the original rubric, but removed during rubric training sessions. Because a majority of medications in the study are oral, and the question does not specifically request route-

refers to a specific amount of hours between doses or specifically states "as needed", those items must be included in the answer. The route is *not* required.	same route of admin), I feel route should be factored into the score. Why is route not required? Concern with injectables & inhalations specifically		many patients did not include route in their answer. It was determined that "how and when" was not specific enough to require the patient to specifically state the route. In the results, will specifically discuss percentage of medications in the study that were not oral medication-potential sensitivity analysis?
Duration of Treatment: Incomplete Answer Answers that generally refer to the correct refill status of the medication without acknowledging that the medication may continue chronically **OR** without acknowledging that they must have approval from the doctor to stop the medication will be scored as incomplete.	Unless refill status was asked specifically, I imagine most patients would not automatically bring up refills when talking about how long they're taking a medication. Also, what if a patient said something like, "Until my sugars are under control" or something else that potentially implies chronic use, but they don't explicitly say that?	No changes.	Refill status was specifically added during rubric training sessions due to multiple patient answers specifically referring to refill status. Refill status is not the only option for how to get an incomplete score. Condition and symptom resolution are addressed specifically in the rubric in the incorrect answer section-multiple conversations among graders with decision being made that symptom resolution

Side Effects Descriptive: Incorrect Answer Any answer that does not indicate a knowledge that side effects are possible OR lists a specific side effect that is not associated with the medication will be scored as incorrect.	To clarify, even if the patient lists 5 correct side effects and 1 incorrect side effect, they are scored as Incorrect?	Any answer that does not indicate a knowledge that side effects are possible OR lists ANY specific side effect that is not associated with the medication will be scored as incorrect.	Clarified wording that ANY side effect that is incorrect would be scored as incorrect. Due to the low number of patient responses, and the potential adherence implications of associating a side effect with a medication incorrectly, decision made to score any incorrect as incorrect.
Side Effects Response: Complete Answer To be scored as correct, the answer must indicate at least one specific and appropriate level of triage for a side effect associated with the medication.	What if the patient lists 5 correct side effects, but only references an accurate triage for 1 and does not address the others? Could add an example like this to Incomplete if appropriate?	Make a change to the incomplete listing Incomplete: Answers that generally refer to a clinically reasonable level of triage, but do not list any associated specific side effects in the previous question. Correct: To be scored as correct, the answer must indicate at least one specific and appropriate level of triage for a side effect listed in the previous answer	Clarified the wording of incomplete and correct answers- but still correct if list only 1- not requiring triage for every side effect to be consistent with the rest of the rubric
Frequency- Meals: Incorrect Answer	This is a little hard to interpret, maybe something like, "Any answer that indicates incorrect timing around meals OR indicates	Any answer that indicates incorrect timing around meals OR indicates that timing with meals does or does not matter	Wording changed to suggested wording

Any answer that indicates taking the medication with or without a meal when that timing is clinically inappropriate or indicates that timing with meals does not matter when timing is clinically important to the medication will be scored as incorrect.	that timing with meals does or does not matter when the opposite is true will be scored as incorrect."	when the opposite is true will be scored as incorrect.	
Frequency- Meals: Incomplete Answer Answers that indicate that the medication is to be taken with or without a meal without indicating that either are acceptable (as applicable) will be scored as incomplete.	I'm unsure what this is trying to say. Something along the lines of, "Answers that indicate the medication is to be taken with or without a meal BUT do not identify correct timing" ??? This may confuse patients for the same reason as my concern with 3a. You'll probably see a higher rate of 1's than you would otherwise get 2's for scoring.	Answers that indicate that the medication is to be taken "with a meal" or the medication is to be taken "without a meal" when the prescription information or the medication reference specifically state that either is acceptable will be scored as incomplete.	Clarified wording- pharmacist has incorrect interpretation of the scoring. There is no other way for incomplete to be possible. The answers during grading "I take all foods with medication" – comproprise- some think incorrect and come think correct
Contraindications/ Precautions/ Warnings: Incorrect Answer Any answer that indicates that there is nothing to avoid when the drug information specifically lists any activity, food, drink, or alcohol that must be avoided while taking the	Would change this to medication reference or whatever terminology is appropriate to keep language consistent throughout the tool.	Edit wording	Wording changed to clarify that the medication reference is the one provided to pharmacists

medicine **OR** specifically lists something to avoid when that item is not listed in the drug information will be scored as incorrect.			
Contraindications/ Precautions/ Warnings: Incomplete Answer Answers that generally refer to a category that should be avoided without specifying what specific activity or item should be avoided will be scored as incomplete.	Category of what? Medicine, food, activity?	**Contraindications/ Precautions/ Warnings: Incomplete Answer** Answers that generally refer to a category (i.e. food, activities, drinks) that should be avoided without specifying what specific activity or item should be avoided will be scored as incomplete.	Medications are addressed in the correct answer
Frequency- Timing: Correct Answer To be scored as correct, the answer must indicate knowledge of the specific time of day (e.g. morning, evening, 6pm) if the prescription information or medication reference lists a specific time of day. If no timing information is listed, the answer may list any appropriate time as the designated time to take the medication. Answers indicating that the timing	This is not directly asked for in the question. The question only asks if there's a best time of day to take the medication; if the actual time of day truly doesn't matter and the patient indicates that, then technically they answered the question correctly. Also, for medications that actually do have a best time of day to take them per medication references (e.g. statins at bedtime) but the prescription doesn't indicate that (common to see statins as "1 tablet PO daily"), how will these be scored?	**Frequency- Timing: Correct Answer** To be scored as correct, the answer must indicate knowledge of the specific time of day (e.g. morning, evening, 6pm) if the prescription information or medication reference lists a specific time of day. If no timing information is listed, the answer may list any appropriate time as the designated time to take the medication. **Answers that generally refer to to a medication frequency**	Time of day and its appropriate remove the part about

does not matter will only be scored correct if the answer also includes reference to taking the medication at the same time every day (as applicable)**.**		**Will be scored as incorrect if that information information is included in the medication reference (add clinical judgement and medication reference to incorrect)**	
Interactions: Correct Answer To be scored as correct, the answer must list at least one medication to avoid if the patient's medication list is assessed clinically and includes a clinically relevant interacting medication. If the patient's medication list does not include any clinically relevant interactions, the answer must indicate knowledge that the medicine is safe for use with other medications.	What if the patient only identifies 1 of 2 indicated interactions? To me, that feels more along the lines of "Incomplete"		Consistency of republic- 1 correct is correct.
Effectiveness: Timing: Incomplete Answer Answers that generally refer to when the medicine will begin to work that is clinically reasonable but do **NOT** refer to a specific	Is this possible? How will a patient refer to when a medicine will begin to work without specifying a time frame? Is this more like if a patient indicates that they do know there's a time frame but they say they don't know exactly when? Is this different to criteria for "No Answer?"	Answers that generally refer to when the medicine will begin to work that is clinically reasonable (i.e. quickly, soon) but do **NOT** refer to a specific time frame (hours, days, weeks, etc.) will be scored as incomplete.	Added example

time frame (hours, days, weeks, etc.) will be scored as incomplete.			

APPENDIX F. FINAL RUBRIC

Category	Incorrect Answer	No Answer	Incomplete Answer	Correct Answer
General Scoring Definitions Across all Categories	**-1** One or more parts of the patient response does **NOT** match **OR** directly contradicts the provided prescription information, the provided medication reference, **OR** your own clinical expertise.	**0** The patient response directly states **OR** indicates he/she does **NOT** know the answer to the question **OR** the patient response does **NOT** address the specific question.	**1** The patient response matches the information in the provided prescription information, the provided medication reference, **OR** your own clinical expertise **BUT** the response is ***incomplete*** (i.e. lacking any information necessary for the safe **AND** correct use of the medication in relation to the question).	**2** The patient response matches the information in the provided prescription information, the provided medication reference, **OR** your own clinical expertise **AND** the response is ***complete*** (i.e. containing all the necessary information for the safe **AND** correct use of the medication in relation to the question).
Category-Specific Scoring Examples				
Name **1. What is the name of your new medicine?**	Any answer that includes an incorrect drug name will be scored as incorrect.	See general definition above.	Answers that generally refer to the correct first letter **OR** a portion of the correct drug name will be scored as an incomplete answer.	To be scored as correct, answer must identify correct drug name (brand **OR** generic). Correct spelling, release mechanism, **AND** salt names are **NOT** required.
Indication **2. Why are you taking your new medicine or what is it used for?**	Any answer that includes a symptom **OR** condition that is **NOT** associated with the indication of the provided prescription information will be scored as incorrect.	See general definition above.	Answers that generally refer to the correct system **OR** organ of the body, but **NOT** a specific condition **OR** symptom will be scored as incomplete.	To be scored as correct, answer must list at least **ONE** condition **OR** symptom that is associated with the indication of the provided prescription information. If the indication is missing from provided prescription information, answer must list at least **ONE**

				condition **OR** symptom associated with the medication within reason according to your clinical expertise.
Usage Instructions **3a. How and when should you take your new medicine…?**	Any answer that refers to a frequency that is different than what is listed in the provided prescription information will be scored as incorrect.	See general definition above.	Answers that generally refer to a frequency, but are **NOT** specific enough to determine if the patient is taking the medication correctly (e.g. stating "as needed" without listing the number of hours between doses as applicable) will be scored as incomplete.	To be scored as correct, the answer must state the correct frequency based on the provided prescription information. If the prescription frequency refers to a specific amount of hours between doses **OR** specifically states "as needed", those items must be included in the answer. The route is **NOT** required.
Duration of Treatment **3b. … and for how long?**	Any answer that specifically indicates an acute duration, stopping the medication based on condition **OR** symptom resolution alone, **OR** that contradicts the provided prescription information will be scored as incorrect.	See general definition above.	Answers that generally refer to the correct refill status of the medication without acknowledging that the medication may continue chronically **OR** without acknowledging that they must have approval from the doctor to stop the medication will be scored as incomplete.	To be scored as correct, the answer must indicate knowledge that medication is planned to be taken on a chronic basis (3 months **OR** more), **OR** acknowledge that the medication will continue until they receive approval from the physician to discontinue the medication.
Side Effects-Descriptive **4a. What side effects should you expect from your new medicine…?**	Any answer that does **NOT** indicate knowledge that side effects are possible **OR** lists **ANY** specific side effect that is **NOT** associated with the medication will be scored as incorrect.	See general definition above.	Answers that generally indicate knowledge that side effects are possible **AND** do **NOT** list any side effect associated with the medication will be scored as incomplete.	To be scored as correct, the answer must indicate knowledge that side effects are possible for the medication **AND** list at least **ONE** side effect that is listed in the provided medication reference.

Side Effects- Response **4b. …and what should you do about them?**	Any answer that indicates an inappropriate level of triage for an associated side effect, **OR** a generally inappropriate response to side effects will be scored as incorrect.	See general definition above.	Answers that generally refer to a clinically reasonable level of triage, but do **NOT** list any associated specific side effects in the previous question.	To be scored as correct, the answer must indicate at least **ONE** specific **AND** appropriate level of triage for a side effect listed in the previous answer.
Frequency- Meals **5. Should you take your new medicine on an empty stomach or with food?**	Any answer that indicates incorrect timing around meals **OR** indicates that timing with meals does **OR** does **NOT** matter when the opposite is true will be scored as incorrect.	See general definition above.	Answers that indicate that the medication is to be taken "with a meal" **OR** the medication is to be taken "without a meal" when the provided prescription information **OR** the provided medication reference specifically state that either is acceptable will be scored as incomplete.	To be scored as correct, the answer must correctly state the timing based on meals if the provided medication reference **OR** provided prescription information indicates that meals must be considered in timing of the medication. If the timing in relation to meals is **NOT** specified, the answer must indicate knowledge that they can take the medication with **OR** without a meal.
Contraindications/ Precautions/ Warnings **6. Should you avoid any activities, foods, drinks, alcohol, or other medicines while taking your new medicine?**	Any answer that indicates that there is nothing to avoid when the provided medication reference specifically lists any activity, food, drink, **OR** alcohol that must be avoided while taking the medicine **OR** specifically lists something to avoid when that item is **NOT** listed in the provided medication reference will be scored as incorrect.	See general definition above.	Answers that generally refer to a category (e.g. foods, activities, drinks) that should be avoided without specifying what specific activity **OR** item should be avoided will be scored as incomplete.	To be scored as correct, the answer must list at least **ONE** activity, food, **OR** drink that should be avoided if the provided medication reference specifically lists **ANY** activity, food, drink, **OR** alcohol that must be avoided while taking the medicine. Medications to avoid are **NOT** required (see interaction question). If the provided medication reference does **NOT** list any activity, food, **OR** drink to avoid, the answer must indicate that the patient is aware that there is nothing to avoid.

Frequency- Timing **7. What is the best time of day to take your new medication?**	Any answer that refers to a specific time of day that is clinically inappropriate **OR** indicates that timing doesn't matter when a specific time is clinically necessary will be scored as incorrect.	See general definition above.	Answers that generally refer to an appropriate medication frequency without any reference to time of day **OR** time between doses will be scored as incomplete.	To be scored as correct, the answer must indicate knowledge of the specific time of day (e.g. morning, evening, 6pm) if the provided prescription information **OR** provided medication reference lists a specific time of day. If no timing information is listed, the answer may list any appropriate time as the designated time to take the medication.
Interactions **8. Will your new medicine work safely with any other medicines you taking, including over-the counter medicines?**	Any answer that refers to an interaction that is deemed clinically unreasonable for the medication in question, **OR** does **NOT** indicate knowledge of potential interactions when interactions are identified on the patient medication list will be scored as incorrect.	See general definition above.	Answers that generally refer to potential interactions but do **NOT** indicate knowledge of the specific name of offending medications when interactions are identified on the patient medication list will be scored as incomplete.	To be scored as correct, the answer must list at least **ONE** medication to avoid if the patient's medication list is assessed clinically **AND** includes a clinically relevant interacting medication. If the patient's medication list does **NOT** include any clinically relevant interactions, the answer must indicate knowledge that the medicine is safe for use with other medications.
Effectiveness-Timing **9a. When should you expect your new medicine to begin to work…?**	Any answer that includes reference to a timeframe that is deemed clinically inappropriate based on the provided prescription information, the provided medication reference, **OR** your own clinical expertise	See general definition above.	Answers that generally refer to a clinically reasonable time period in which the medicine may begin to work (e.g. quickly, soon) but do **NOT** refer to a specific time frame (e.g. hours, days, weeks, etc.) will be scored as incomplete.	To be scored as correct, the answer must indicate knowledge of the specific time frame given in the provided medication reference **OR** the provided prescription information as applicable, **OR** if a specific time frame is **NOT** given, the answer must give a specific time frame (hours, days, weeks, etc.) that is

				considered clinically reasonable for medication in question.
Effectiveness-Descriptive **9b. …and how will you know if it's working?**	Any answer that includes reference to an inappropriate monitoring parameter **OR** indicates that there is no way to know if the medication is working will be scored as incorrect.	See general definition above.	Answers that indicate general knowledge the doctor will follow changes **OR** symptoms will change but do **NOT** list any specific lab, goal **OR** symptom will be scored as incomplete.	To be scored as correct, the answer must list at least **ONE** appropriate monitoring parameter (e.g. lab parameter, treatment goal, **OR** symptom resolution) associated with the medication.
Storage **10. How should you store your new medicine?**	Any answer that includes reference to storage in an inappropriate location based on temperature, humidity, **OR** safety will be scored as incorrect.	See general definition above.	Answers that include reference to humidity **OR** temperature, but **NOT** both, **OR** answers that refer to another general category of medication storage such as safety will be scored as incomplete.	To be scored as correct, the answer must include reference to humidity (dry) **AND** temperature (room temperature **OR** refrigerated as appropriate). Reference to protecting the medication from light is **NOT** required.

APPENDIX G. COMPARISON OF DRUG INFORMATION SOURCES

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Lisinopril - Lexicomp - Micromedex	- take with or without food - take at the same time each day - take this drug exactly as told by your doctor, even if you feel well - take as directed, your dose may need to changed several times - no information on with/without food	aliskiren, some cough/cold medicine, diet pills, stimulants, NSAIDs aliskiren, everolimus, lithium, sirolimus, temsirolimus, ARBs, diuretics, NSAIDs	- do not take while pregnant or breastfeeding - this medication is NOT safe in pregnancy - tell your MD if you are breastfeeding, have kidney disease, liver disease, or DM - your BP could get too low causing dizziness, stand or sit up slowly	- allergic reaction, unable to pass urine, high potassium (abnormal heart beat), dizziness, passing out, cough, upset stomach, chest pain, liver problems, lip swelling - allergic reaction, skin rashes, change in urations, confusion, weakness, lightheadedness, dizziness, fainting, stomach pain, swelling of face or hands

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Atorvastatin - Lexicomp - Micromedex	- take this drug at the same time each day - take with or without food - take this drug exactly as told by your doctor, even if you feel well - take as directed, your dose may need to be changed several times - take this medicine at the same time each day - swallow the tablet whole, do not crush or chew - no infromation on with/without food	- grapefruit juice, cycloporin, gemfibrozil, glecaprevir + pibrentasvir, letermovir, tipranaivr + ritonivir - boceprevir, cimetidine, clarithromycine, colchicine, cyclosporine, digoxin, erythromyin, gemfibrozil, glecaprevir/pibrentasvir, itraconazole, ketoconazole, niacin, rifampin, spironolactone, birth control, blood thinners, fibrates, HIV/AIDS medications, grapefruit	- this drug may cause harm to an unborn baby - do not breastfeed while using this medication - risk of severe muscle pain/weakness - it is not safe to use this medication during pregnancy/lactation - tell your MD if you have kidney disease, DM, infection, myscle pain, weakness, seizures, thyroid problems or recent stroke	- allergic reaction, UTI, stroke, confusion, weakness, muscle pain/tenderness/weakness, liver problems - rhabdomyolysis, allergic reaction, red skin rash, changes in urination, fever, unexplaine dmuscle pain/tenderness/weakness, unusual tiredness

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Levothyroxine - Lexicomp - Micromedex	- take on an empty stomach 30-60 minutes before breakfast - do not take iron products or antacids with Al/Mg/CaCO3 4 hours before or after taking this medication - other medications may need to be scheduled separately from this medication - take this drug exactly as told by your doctor, even if you feel well - take as directed, your dose may need to be changed several times - you may have to take this medicine 4-8 weeks before you start feeling better - take in the morning 30-60 minutes before breakfast on an empty stomach - do not cute, chew or crush the tablet	- soybean flour, grapefruit - amiodarone, carbamazepine, dexamethasone, digoxin, 5FU, furosemide, imatinib, ketamine, methadone, phenobarbital, phenytoin, rifampin, tamoxifen, beta blockers, estrogen, blood thinners, TCAs, NSAIDs, steroids - some medications need to be separated from this drug (antacids, cholesterol medicaions, stomach medicine, calcium, and iron - grapefruit	- do not use this drug to treat obesity or weight loss - it may take several weeks to see the full effects - this drug may cause osteoporosis - this drug may affect fertility - this medicine should not be used to treat obesity - do not stop using suddenly	- allergic reaction, high blood pressure, fast/abnormal heart beat, weight changes, anxiety, irritability, sweating, bone pain, menstrual changes - allergic reaction, chest pain, confusions, swelling , dizziness, stomach pain, fast/pounding heartbeat, seizures, tremors, headache, blurred vision, hip/knee pain, low bone density

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Metformin - - Micromedex Lexicomp	- take with meals - swallow whole do not chew, break, or crush (XR) - best taken with food/milk - swall the XR tablet whole. Do not crush/break/chew	- Not provided - acetazolqamide, cimetidine, dolutegravir, isoniazid, phenytoin, ranolazine, topiramate, zonisamide, birth control, diuretics, phenothiazine, steroids, thyroid meds	- lactic acidosis BBW - lactic acidosis - part of the XR capsule may appear in the stool. This is normal - may cause changes to menstrual cycle	- allergic reaction, belly pain, upset stomach, throwing up, diarrhea, low blood sugar - allergic reaction, low blood sugar, fever/chills, stomach pain, trouble breathing, slow/fast heart rate, tiredness, weakness
Amlodipine - - Micromedex Lexicomp	- take at the same time each day - take with or without food - keep taking this med as told by your MD, even if you feel well - take as directed, your dose may need to be changed several times to find the dose that works best for you - take at the same time each day	- cough/cold meds, diet pills, stimulants, NSAIDs - clarithromycin, cyclosporin, diltiazem, itraconazole, ritonavir, sildenafil, simvastatin, tacrolimus	- do not use this med to treat sudden chest pain, it will not help. - risk of liver damage - low blood pressure, warsening chest pain, increased risk of heart attack	- sx of liver dysfunction: dark urine, feeling, tired, spmach pain, throwing up, yellow skin/eyes - allergic reaction, dizziness/fainting, chest pain, fast/abnormal heart beat, swelling, stiff muscles, tremors - allergic reaction, lightheadedness/dizziness, new or worsening chest pain, swelling in hands/ankles/feet, trouble breathing, nausea, sweating

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Metoprolol - Lexicomp - Micromedex	- regular tabs: take with food, swallow whole, keep taking even if you feel well - XR tabs: take with food, swallow whole, do not crush, keep taking even if you feel well - XR caps: take with or without food, swallow whole, do not crush, can be sprinkled into applesauce (must take within 60 min) - take at the same time every day, with a meal - XR cap: swallow whole or sprinkle contents in food. take within 60 minutes - tabs: swallow whole, can be broken in half, but do not crush or chew	- cough/cold meds, diet pills, stimulants, NSAIDs - conidine, digoxin, hydralazine, hydroxychloroquine, methyldopa, prazosin, CCBs, ergots, MAOIs, anti-arrhythmetics, HIV meds, terbinafine, typical antipsychotics	- do not stop taking this medication suddenly - do not stop using this medication suddenly - avoid alcohol while on this medication - may worsen sx of HF while titrating dose - may cause low blood pressure	- allergic reaction, depression, dizziness/fainting, chest pain, abnormal heart beat, slow heart beat, SOB, peripheral edema - allergic reaction, lightheadedness, dizziness, faitning, slow hearbeat, swelling in hands/ankles/feet, worsening chest pain

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Omeprazole - - Micromedex Lexicomp	- take before meals - swallow whole, do not crush or chew. Capsule contents may be sprinkled in food (must be taken immediately) - if using OTC do not use for more than 14 days - tab/cap swallow whole, do not crush/chew. Can pour contents of capsule into food. - take before meals	- atazanivir, clopidogrel, nelfinavir, rifampin, rlpivirine, St. John's wort - amoxicillin, atazanavir, citalopram, clarithromycin, clopidogrel, cyclosporine, digoxin, itraconazole, ketoconazole, MTX, phenytoin, rifampin, St. John's wort, tacrolimux, benzos, warfarin, diuretics, iron supplements	- increased risk of osteoporosis and Lupus - risk of kidney problems, osteoporosis, Lupus, fundic gland polyps	-allergic reaction, muscle pain/weakness/spasms (low Mg), kidney dysfunction, liver dysfunction, dizziness, bone pain, tiredness/weakness - allergic reaction, red skin rash, fever, joint pain, swelling, unusual weight gain, seizures, dizziness, abnormal heart beat, diarrhea, stomach cramps, N/V, extreme weight loss
Simvastatin - - Micromedex Lexicomp	- take in the evening - take liquid on an empty stomach -take in the evening - liquid should be taken on an empty stomach	- avoid grapefruit juice - medications for HIV and depression - clarithromycin, cobicistat, cyclosporine, erythromycin, gemfibrozil, ketoconazole, HIV meds, aniodarone, colchicine, dapto, digoxin, niacin, ranolazine, CCBs, warfarin, fibrates - avoid grapefruit	- this medication should not be used in pregnancy/lactation - may cause liver damage - do not use if pregnant/breastfeeding - do not use if you have active liver disease - may cause liver problems, myopathy, rhabdo	- allergic reaction, abnormal heartbeat, kidney dysfunction, muscle pain/weakness/tenderness, liver problems - allergic reaction, red skin rash, liver dysfunction, arrhythmia, trouble breathing, muscle pain/weakness/tenderness, usual tiredness

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Losartan - Lexicomp - Micromedex	- take with or without food - take medicine as directed - drink a lot of water	- cough/cold meds, diet pills, stimulants, NSAIDs - lithium, rifampin, spironolactone, triamterene, amiloride, NSAIDs, aliskiren, ACEs	- do NOT take while pregnant - NOT safe for pregnancy - report any cases of angioedema - risk of low blood pressure	- allergic reaction, kidney problems, high potassium/arrhythmia, low blood sugar, dizziness/fainting, swelling in arms/egs - allergic reaction, changes in urination, confusion, weakness, abnormal heartbeat, neuropathy, dizziness/fainting, rapid weight gain, swelling in hands/legs/feet
Albuterol - Lexicomp - Micromedex	-if using for sports, use immeditaely before beginning activity - shake well before use - the inhaler needs to be primed before the 1st dose - shake well before each use - prime inhaler before first use - breathout fully before use - after using the medication hold breath for 5-10 s and breath out slowly - if taking more than 1 puff wait 1-2min before doing 2nd puff	- milk allergy (dry powdered inhalers) - milk protein allergy, digoxin, beta blockers, diuretics, MAOIs	- do not use more often than instructed - risk of paradoxical bronchospasm,	- allergic reaction, high blood pressure, low potassium (muscle pain/weakness/cramping), increased heart rate - allergic reaction, chest pain, heart punding, dry mouth increased thirst, muscle cramps, N/V,

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
	- clean at least once a week			
Gabapentin - Lexicomp - Micromedex	-separate from antacids - take with evening meal (Gralise) - take with or without food (others) - swallow whole, do not crush or chews - may split tablets (must use within 28 days) -take as directed - if taking for epilepsy do not let >12 hours pass between doses - swallow whole, do not crush/chew - may split tab, but must be taken within 28 days	Not provided '- separate from antacids - do not drink alcohol - "medications that make you sleepy ---> allergy meds, narcotics, lorazepam, oxcodone, zolpidem	-do not stop taking all of the sudden - risk of mood/behavior problems when used with children - do not stop taking suddenly - risk of DRESS syndrome - may cause changes in mood/suicidal ideation - risk of respiratory depression	-allergic reaction, liver dysfunction, kidney dysfunction, trouble controlling bodily movements, confusion, memory loss, shallow breathing, SOB, not abl to control eye movements, fever, chills, sore throat, bruising/bleeding, muscle pain/weakness, suicidal thoughts - allergic reaction, behavioral problems, red skin rash, blue lips, fast hearbeat, trouble breathing, change in urination, liver dysfunction, yellowing of skin/eyes, problems with coordination, tremors, shakiness, unusual eye movement, rapid weight gain, unusual moods/behaviors

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Hydrochlorothiazide - Lexicomp - Micromedex	- take as prescribed by your MD - may cause increased urination, don't take a bedtime - do not use if sulfa allergy	- cough/cold meds, diet pills, stimulants, NSAIDs - cholestyramine - cholestyramine, colestipolm dig, litium, insulin, NSAIDs	Not provided - glaucoma - acute gout - damage to parathyroid gland - electrolyte/mineral abnormalities	- allergic reaction, fluid/electrolye imbalance, pancreatitis, kidney dysfunction, peripheral neuropathy, SOB, restlessness, eye problems, skin cancer allergic reaction, rash, confusions, weakness, muscle twitch, drymouth, N/V, arhythimua, lightheadedness, dizziness, vision changes
Hydrocodone/Acetaminophen - Lexicomp - Micromedex	- with or without food - do not take with other strong pain meds - drink plenty of fluids to avoid constipation - follow directions carefully so you do not take too much medication at one time	- buprenorphine, linezolid, methylene blud, isocarboxazid, MAOIs - MAOIs (within 14 days), carbamazepine, erythromycin, ketoconazole, mirtazapine, phenytoin, rifampin, ritonavir, tramadol, trazodone, diuretics, deppression, migraine	- risk of addiction, abuse, overdose and death - respiratory depression - should not be mixed with benzodiazepines - should not be mixed with alcohol - limit acetaminophen intake - risk of habit forming - contains acetaminophen - infertility - risk of overdose/death - respiraotry depression - liver problems - serious skin reactions (SJS) - serotonin syndrome	- allergic reaction, dizziness, fainting, sweating, confusion, constipation, urinary changes, fast or slow hearbeat, trouble breathing, mood chagnes, seizures, changes in eyesight, SJS, serotonin syndrome - allergic reaction, anxiety, fast heartbeat, muscle spasms, hallucinations, red skin rash, blue lips, fingernails, dark urine, loss of appetit, nausea, vomiting, yellow skin/eyes, shallow breathing, slow hearbeat, seizures, sweating, dizziness, fainting

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Sertraline - Lexicomp - Micromedex	- with or without food (tabs) - take with food (capsules) - keep taking, even if you feel well - take as directed - it may take several weeks to months to see an effect	- linezolid, methylene blue, pimozide MAOIs, QTc prolonging agents - MAOI (within 14 days), buspirone, cimetidine, cisapride, diazepam, digoxin, fentanuyl, flecainide, litium, phentytoin, propafenone, St. John's wort, tramadol, tryptophan, valproate, warfarin, diuretics, NSAIDs, TCAs, triptans	- do not stop taking suddenly - increased risk of suicidal thoughts/actions -avoid drinking alcohol - may take 4 weeks to see improvements - risk of serotonin syndrome - serotonin syndrome - low sodium - do not stop taking suddenly -	- allergic reaction, low sodium, bleeding, SJS, loss of bladder control, weight gain/loss, decreased sex dribe, liver problems, arrhythmia - allergic reaction, anxiety, fast hearbeat, fever , seating, spasms, nausea, hallucinations, confusions, red skin rash, weakness, vision changes, mania, suicidal thoughts/ehaviors, usuaual bruising/bleeding
Fluticasone - Lexicomp - Micromedex	- do not take by mouth - keep takin geven if you feel well - some product may need to be primed - shake well before use - blow nose before use - only used for nose - shake well before use - prime before using for the first time by spraying 6 times into the air away form the face - blow nose before use -	- atazanavir, clarithromycin, conivaptan, indinavir, itraconazole, ketoconazole, lopinavir, ritonacir, voriconazole - conivaptan, nefazodone, HIV meds, clarithromycin, ketoconazole, itraconazole	- increased risk of cataracts/glaucoma - risk of osteoporosis - risk of ulcer or bleeding inside the nose - increase risk of infection - slow wound healig - risk of cataracts or glaucoma - adrenal gland prblems - osteoporosis - slow growth in children	- allergic reaction, adrenal insufficiency, nose sores, nose bleeds, thrust, vision changes, runny nose, bone pain, sore throat - allergic reaction, bone pain, burning/redness inside nose, vision changes, cough, sore throat, body aches, nose bleeds, thrush, N/v, weight loss, weakness

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Montelukast - - Micromedex Lexicomp	- take with or without food - keep taking even if you don't have sx - take in the evening if for asthma - do not use more than directed - do not open pack of granules until ready for use	Not provided aspirin, phenobarbital, NSAIDs, steroids	- suicidal thoughts/actions - not to be used for intense flare ups - this medication will not stop an asthma attack - may cahnges changes in mood/behavior - increase eosinophils - Churg-Strauss syndrome	- allergic reaction, SJS, trouble breathing, fever, flu like sx, sinus pain, burning/numbness/tingling, ear pain - allergic reaction, red skin rash, chest pain, irregular heart bet, cough, runny/stuff nose, sore throat, body aches, numbness/tingling, pain/swelling in sinses or ear, restlesness, anxiety, stomach pain, unusual bruising/bleeding

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
Furosemide - - Micromedex Lexicomp	- may not want to take before bed d/t inc urination - do not take if product changes color - may take with food if experiencing upset stomach - swallow whole, do not crush/break/chew	- sucralfate, ethacrynic acid, litium, cough/cold meds, diet pills, stimulants, NSAIDs cisplatin, cyclosporine, digoxin, ethacrynic acid, licorice, litium, MTX, phenytoin, ACTH, laxativs, NSAIDS, steroids, thyroid medications, sucralfate, alcohol, narcotics, sleeping pills	- may cause fluid/electrolyte imbalances electrolyte imbalances, blood sugar level changes, hearing problems, orthostatic HTN, sun sensitivity	- allergic reaction, fluid/electrolyte imbalances, confusion, muscle pain, arrhythmia, seizures, musvcle cramping, weakness, tiredness, high blood sugar, liber problems, kidney proble,s, pancreatitis, vision changes, neuropathy hearing problems, low blood counts, restlessness allergic reaction, red skin rash, confusion, weakness, muscle twitching, dry mouth, increased thirst, irregular heartbeat, stomach pain, lighteadedness, nausea, hearing changes, fainitng, diarrhea, unusual bruising/bleeding, yellow skinb/eyes
Amoxicillin - - Micromedex Lexicomp	- ER tab take within 1 hour of meal, swallow whole, do not break/chew/crush - other products can be taken without or with food if stomach is upset - take at the same time each day - take all of the meidicne you are prescribed to ensure the infection is cleared,	Not provided allopurinol, preobenecid, birthcontrol, blood thinners	- do not use longer than you have been told - may cause oral birth control to be less effective - risk of serious allergic reaction - C. diff - diarrhea	- allergic reaction, bruising/bleeding, fever/chills, vaginal itching/discharge, diarrhea, SJS allergic reaction, red skin rash, diarrhea

Medication	Drug administration	Drug/Food Interactions	Warnings/Contraindications	Serious Side Effects
	even if you feel better -			
Pantoprazole - - Micromedex Lexicomp	- take with or without food - swallow whole, do not chew break or curhs - keep taking even if you feel well - swallow whole, do not crush break or chew	atazanivir, nelfinavir, rilpivirine ampicillin, atazanavir, dasatinib, digoxin, erlotinib, ketoconazole, MTX, mycophenolate, blood thinners, diuretics, iron supplements	- risk of stomach ulcer - inc risk of osteoporosis - may cause low Mg and B12 - risk of kidney dysfunction, osteoporosis, Lupus, fundic gland polyps, diarrhea,	- allergic reaction, low Mg, mood changes, muscle pain or weakness, seizures, spasms, loss of appetitie, nausea, irregular heartbeat, kidney dysfunction, bone pain, fever, Lupus, C. diff, SJS allergic reaction, red skin rash, fever, joint pain, swelling, weight gain, changes in urination, siezures, dizziness, arrhythmia, msucle cramps, diarrhea, cramping , nausea, vomiting
Escitalopram - - Micromedex Lexicomp	- take with or without food - keep taking even if you start to feel well - may need to take for at least a month until you start feeling better	- linezolid, methylene blud, citalopram, pimozide, MAOIs (within 14 days) - pimozide, MAOI (within 14 days). Buspirone, carbamazepime, fentanyl, lithium, st john's wort, tramadol, ampehtamines, blood thinner,s diuretics, NSAIDs, triptans	- increase risk of suicidal thoughts/actions - risk of HTN - do not stop taking suddenly - serotonin syndrome - low sodium - inc risk of bleeding - increased suicidal thoughts/actions	- allergic reaction, low Na, bleeding, seizures, fever, chills, dexual dysfunction, erection that lasts >4 hrs, serotonin syndrome '- allergic reaction, anxiety, restlessness, fever, seating, muscle spasms, nausea, vomiting, diarrhea, hallucintions, confusion, cision changes, irregular heartbeat, mania, seizures, suicidal thoughts/behaviors, unusual bruising/bleeding

Medication	Other Side Effects	Missed Dose Information	Storage & Disposal
Lisinopril - - Micromedex Lexicomp	- dizziness, headache, dry cough - dry cough	- take any missed doses as soon as you remember - if it is close to the time of your next dose skip it, and take your regularly scheduled dose - do not take 2 doses at the same time or extra doses - take a missed dose as soon as you remember - if it is almost time for your regular dose, skip it and take the dose as scheduled - do not take extra medicine to make up for a missed dose	- store at room temp in a dry place - do not store in the bathroom - store at room temp in a closed container away from heath, moisture, and direct light
Atorvastatin - - Micromedex Lexicomp	- diarrhea, joint pain, upset, stomach, nose/throat irritation, trouble sleeping - arm/leg/joint pain, diarrhea, stuffy or runny nose	- take a missed dose as soon as you think about it and go back to your normal time - if it has been 12 hours or more since the issed ose, skip the missed dose and go back to your normal time - do not take 2 doses at the same time or extra doses - take the missed dose as soon as you remember - if it is less than 12 hours until your next dose, skip the dose and take the next dose as scheduled - do not take 2 doses of the medication within 12 hours of each other	- store at room temp in a dry place - store at room temp in a closed container away from heath, moisture, and direct light

Medication	Other Side Effects	Missed Dose Information	Storage & Disposal
Levothyroxine - - Micromedex Lexicomp	- some patients may experience hair loss in the first few months, this most often goes back to normal - appetite or weight changes, changes in menstrual periods, diarrhea, hair loss, muscle spasm or weakness, nervousness, sensitivity to heat, insomnia	- take a missed dose as soon as you think about it - if it is close to th etime for your next dose, skip the missed dose and go back to your normal time - do not take 2 doses at the same time or extra doses - take a dose as soon as you remember - if it is almost time for your next dose, wait until then and take your regular dose - do not take extra medicine to make up for a missed dose	- store at room temp - protect from heat and light - store in a dry place, not in the bathroom - store in a closed container at room temp, away from heat, moisture and direct light - if taking oral liquid, use within 15 days within opening pouch. Keep ampules in pouch until you are ready to use them
Metformin - - Micromedex Lexicomp	- stomach pain, diarrhea, gas, throwing up, heartburn, feeling weak/tired, headache - diarrhea, gas, metallic taste	- skip the missed dose and go back to yur normal time - do not take 2 doses at the same time or extra doses - take a dose as soon as you remember. If it is almost time for your next dose wait until then and take a regular dose. Do not take extra medication to make up for a missed dose.	- store at room temp in a dry area, not in the bathroom - store in a closed container at room temp away from heat, moisture, and direct light
Amlodipine - - Micromedex Lexicomp	- dizziness, weakness, sleepiness, flushing, stomach pain	- take a missed dose as soon as you remember - if it has been >12 hours, skip the dose and return to regular schedule - do not double dose or take extra doses - take a dose as soon as your remember. If it is almost time for your next dose, wait until your regular dose - do not take extra medicine to make up for a missed dose	- store in a dry place away from heat and light - keep tablets at room temp - store liquid in the refrigerator. Do not freeze. -store medication at room temp, away from heat, moisture, and direct light - store oral liquid in the fridge, do not freeze

Medication	Other Side Effects	Missed Dose Information	Storage & Disposal
Metoprolol - - Micromedex Lexicomp	- dizziness, tiredness, weakness, diarrhea, vomiting - diarrhea, dizziness, tiredness	- skip the missed dose and go back to your normal time - do not take 2 doses at the same time/extra doses - take a dose as soon as your remember. If it is almost time for your next dose, wait until then and take your regular dose as scheduled. - do not take extra medicine to make up for a missed dose.	- store at room temp in a dry place, not in the bathroom. Protect from heat. - store in a closed container at room temp, away from heat, moisture, and direct light
Omeprazole - - Micromedex Lexicomp	- HA, N/V, stomach pain, diarrhea, gas - HA, diarrhea, stomach pain	- take a missed dose as soon as you remember, if it is close to the time your next dose is due skip it and take the dose as scheduled, do not double up. - take a missed dose as soon as you remember, if it is almost time for your next dose skip it and resume your regular schedule. Do not take extra doses	- store at room temp in a dry area, not in the bathroom. - protect from light - store in a closed container at room temp, away from heat, moisture and light
Simvastatin - - Micromedex Lexicomp	- HA, stomach pain, constipation, cold sx - HA, constipation	- take a missed dose as soon as you remember, if it is close to the time your next dose is due skip it and take the dose as scheduled, do not double up. - take a missed dose as soon as you remember, if it is almost time for your next dose skip it and resume your regular schedule. Do not take extra doses	- store at room temp in a dry area, not in the bathroom. - protect from light - store in a closed container at room temp away from heat moisture and direct light
Losartan - - Micromedex Lexicomp	- cold sx, dizziness, diarrhea, feeling tired/weak, back pain - diarrhea, tiredness	- take a missed dose as soon as you remember, if it is close to the time your next dose is due skip it and take the dose as scheduled, do not double up. - take a missed dose as soon as you remember, if it is almost time for your next dose skip it and resume your regular schedule. Do not take extra doses	- store at room temp in a dry place, not in the bathroom. Protect from light - store in a closed container at room temp away from heat moisture and direct light

Medication	Other Side Effects	Missed Dose Information	Storage & Disposal
Albuterol - Lexicomp - Micromedex	Not provided HA, runny/stuff nose, sore throat, tremors, nervousness	- many times this drug is used as needed - if you miss a dose skip the dose and go back to your normla time, do not use extra doses - do not use more than directed - take missed dose as soon as you remember, if it is almost time for your next dose, skip it and take your regularly scheduled dose	-protect from extreme cold - protect from heat and sunlight - store with the mouthpiece on - store at room temp in a dry area, not the bathroom -store at room temp away from heat and direct light, do not freeze. Do not keep in car where it can be exposed to extreme hot or cold -store with mouthpiece on
Gabapentin - Lexicomp - Micromedex	- dizziness, tiredness, weakness, diarrhea, nausea, dry mouth - dizziness, drowsiness, tiredness	- if you miss a dose skip the dose and go back to your normla time, do not use extra doses - if you miss a dose skip the dose and go back to your normla time, do not use extra doses	-store liquid in the fridge - store all other products at room temp, in a dry place, not the bathroom - store liquid in the fridge - store in a closed container at room temp (tabs/caps) away for heat moisture and direct light
Hydrochlorothiazide - Lexicomp - Micromedex	constipation, stomach cramps, dizziness, weakness, tiredness, HA headache, diarrhea, constipation, nausea	- if you miss a dose skip the dose and go back to your normla time, do not use extra doses - if you miss a dose skip the dose and go back to your normla time, do not use extra doses	-store liquid in the fridge - take as directed

Medication	Other Side Effects	Missed Dose Information	Storage & Disposal
Hydrocodone/Acetaminophen - Lexicomp - Micromedex	- constipation, vomiting, heartburn, nausea, dizziness, sleepiness, weakness, headache - constipation, nausa, vomiting, tiredness of sleepiness	- do not double up to replace a missed dose - take as soon as you remember. If it is almost time for your next dose wait until then and take your regular dose. Do not take extra medicine to make up for a missed dose.	- store at room temp in a dry place, not in the bathroom - keep in a safe place away from children - store in a closed container at room temp away from heat, moisture and direct light. - drop off any unused medication at a drug take back program right away
Sertraline - Lexicomp - Micromedex	- dizziness, tired, weakness, constipation, diarrhea, nausea, decreased appetitie, dry mouth, insomia, increase sweating, shakiness - dry mouth, loss of appetitie, weight loss, diarrhea, constipation, nausea, comiting, sexual dysfunction, insomnia	- take a missed dose as soon as you think about it - if it is close to the time for your next dose, skip it and go back to your normla time - do not double up to make up for missed doses - take the dose as soon as you remember. If it is almost time for your next dose wait unti then and take your regular dose. do not take extra medicine to make up for a missed dose	- store at room temp, in a dry area, not in the bathroom - store in a closed container at room temp away from heat moisture and direct light
Fluticasone - Lexicomp - Micromedex	HA, nose/throat irritation, nosebleed, cough, upset stomach , stuffy nose, stinging/sneezing headache	- use a missed dose as soon as you think about it. If it is close to the time for your next dose, skip it and take the dose at your normal time. Do not double up. - take the dose as soon as you remember. If it is almost time for your next dose wait unti then and take your regular dose. do not take extra medicine to make up for a missed dose	- room temp awyt from heat cold and light - store upright with cap on - store in a closed container at room temp away from heat moisture and direct light

Medication	Other Side Effects	Missed Dose Information	Storage & Disposal
Montelukast - - Micromedex Lexicomp	- HA, stomach pain, diarrha, cold sx, cough diarrhea, HA	- skip missed dose and go back to your regular schedule - do not double up to make up for missed doses - if you miss a dose skip it and go back to your regular schedule. D onot double up	- store at room temp in a dry place protected from light, not in the bathroom - store in original container - store in original container, at room temp away from heat and direct light
Furosemide - - Micromedex Lexicomp	- dizziness, HA, diarrhea, constipation, nausea, lack of appetite, stomach cramping -loss of appetite, stomach cramps -	- take a missed dose as soon as you think about it - if it is close to the time for you rnext dose, skip it and go back to your normal time - do not double up to make up for a missed dose - take a dose as soon as you remember. - if it is almost time for your next dose, skip it and take the dose at your regular time - do not double up to make up for a missed dose	- store at room temp protected from light in a dry place, not the bathroom - store in a close container at room temp away from heat moisture and direct light
Amoxicillin - - Micromedex Lexicomp	- diarrhea, N/V, HA diarrhea, nausea, vomiting, mild skin rash	- if you miss a dose take it as soon as you think about it - if it is close to the time for your next dose, skip it and return to your regular time - do not double up to make up for a missed dose - take a missed dose as soon as your remember - if it is almost time for your next dose wait until then and take your regularly scheduled dose - do not take extra medicine to make up for a missed dose	- liquid can be stored at room temp or the fridge - throw away any liquid that has not been used after 14 days - all other product should be stored at room temp in a dry place, not in the bathroom - store all tablets and capules at room temp away from heat moisture and direct light - store oral liquid in the fridge - throw away any unused liquid after 14 days

Medication	Other Side Effects	Missed Dose Information	Storage & Disposal
Pantoprazole - - Micromedex Lexicomp	- HA, nausea, diarrhea, vomiting, gas, dizziness, joint pain, cold sx HA	- take amissed dose as son as you think about it - if it is close to the time for your next dose, skip it and go back to your normal schedule - do not double up to make up for a missed dose - take a missed dose as soon as your remember - if it is almost time for your next dose wait until then and take your regularly scheduled dose - do not take extra medicine to make up for a missed dose	- store at room temp in a dry place, ot in the bathroom - store in a closed container at room temp away from heat moisture and direct light
Escitalopram - - Micromedex Lexicomp	- dizzy, sleepy, weake, nausea, diarrhea, constipation, dry mouth, insomnia, sweating, flu like sx, renny nose, HA '- dizziness, drowsiness, sleepiness, dry mouth, headache, nausea, constipation, diarrhea, sexual dysfunction	take a missed dose as soon as you think about it - if it is close to the time for our next ose, skip it and go back to your normal time - do not double up to make up for a missed dose - take a missed dose as soon as your remember - if it is almost time for your next dose wait until then and take your regularly scheduled dose - do not take extra medicine to make up for a missed dose	- store at room temp in a dry place, not in the bathroom '- store in a closed container at room temperature away from heat moisture and direct light

APPENDIX H. APPROVAL TO USE BMQ

RE: Approval to Use BMQ for Dissertation Research

From: **Horne, Robert** | r.horne@ucl.ac.uk — Monday, Feb 15, 2016, 11:13 PM

To: **Jaclyn Myers** | myers.jaclyn@gmail.com, **rob.horne@pharmacy.ac.uk** | rob.horne@pharmacy.ac.uk

Cc: **Weller, Penny** | p.weller@ucl.ac.uk

Dear Jacklyn
You are welcome to use the BMQ according to our standard conditions (attached)
You may also be interested in the Satisfaction with Information about Medicines Scale (given our research topic)

Good luck with your research. Please feel free to keep in touch. I'd be interested in hearing about your findings when ready for sharing
Best wishes
Rob

Rob Horne
Professor of Behavioural Medicine

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> From: **Jaclyn Myers** | myers.jaclyn@gmail.com To: **rob.horne@pharmacy.ac.uk** Tuesday, Feb 9, 2016, 7:15 PM
>
> Dr. Horne,
>
> I am currently an PhD Candidate at Purdue University, and I am hoping to gain your approval to use the BMQ for my dissertation