CLINICAL INERTIA:

MEDICATION ADHERENCE

By

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CLINICAL INERTIA: MEDICATION ADHERENCE

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Abstract: Medication adherence refers to whether individuals take their medications as prescribed by a healthcare specialist. Medication adherence is often understated; however, it is evident as a key element in optimizing care in the healthcare continuum. Epidemiological studies indicate that non-adherence of medications causes 125,000 deaths annually and accounts for 10% to 25% of hospital and nursing home admissions in the U.S. Medication adherence is an integral part of the medical enterprise. Healthcare professionals should mollify medication non-adherence because non-adherent behavior is a preventive and expensive issue in the enterprise. Nevertheless, the understanding behind medication adherence is complex and individual. Adherence can be divided into dimensions that reflect this behavior. In this study, we assess specific determinants within these dimensions; adverse drug reactions and self-monitoring of blood pressure, and health professional involvement. Examining these determinants effect on medication adherence we found no significant difference in medication adherence. An improved understanding is vital to resolve the quandary behind medication-taking behavior and achieve optimal health outcomes and low cost for patients.

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CHAPTER I

MEDICATION ADHERENCE

Statement of the Problem

125,000 Americans die annually due to poor medication adherence, and those numbers are rising (McCarthy, 1998). New England Healthcare Institute (NEHI) estimates that potential savings from adherence and related disease management could be 290 billion annually 13% of health spending (NEHI Research Brief, 2009). Medication adherence is becoming a burgeoning crisis in the United States as populations increase and pharmacotherapy becomes more prevalent (Brown & Bussell, 2011). Medication is a vital measure of the medical enterprise. Healthcare professionals should mollify medication non-adherence because non-adherent behavior is a preventive and expensive issue in the enterprise. If these troubles persist, this could lead to an increase of economic burden in the United States Healthcare System.

Medication adherence

The World Health Organization (WHO) defines medication adherence to long-term therapy as "the extent which a person's behavior-taking medication...". Adherence, is not solely limited to adherence to medications but to other treatments (e.g. diet, exercise, lab testing, devices) Adherence, compliance, and concordance are terms used interchangeably. The connotations of these terms are rather different. The terms

adherence is preferably used to describe this behavior. Adherence presumes the patient's agreement with the recommendations (Brown & Bussell, 2011). The term compliance implies patient passivity. Patients are not coerced to under treatment given. Despite the physician's professional judgement, the informed individual has the right to accept or decline treatment. Steiner and Earnest, professors at Colorado Health Sciences Center, argue both terms are controversial in describing medication-taking behavior because the" exaggerate the physician's control over the process of taking medications." (Steiner & Earnest, 2000). The terms to describe the complex issues surrounding medication taking for chronic illnesses cannot be consolidated into one word. The defining this complexity will aid in avoiding assigning blame exclusively to patient and physicians and assist in identifying effective solution (Brown & Bussell, 2011).

Purpose of the Study

The purpose of the study is to gain a better understanding of medication taking behavior by assessing the elemental proclivity. Medication adherence is multidimensional. The impact of adherence is spread among several dimensions; the physician, the health care system, the condition, the treatment, and the patient (World Health Organization Incorporated, 2003). The study will investigate these dimensions by evaluating subjects about condition-related, therapy-related, and physician related determinants that are derived from medication adherence. Subjects will be asked a series of questions concerning their medication taking performance parallel to the present of adverse drug

reactions, blood pressure monitoring methods, and their encounters with specialist involving their healthcare. Understanding and assessing adherence is essential in treating chronic conditions to achieve optimal health outcomes for patients participating in long-term therapies.

H1: Individuals who experience ADRs and have consulted with a healthcare professional (physician or pharmacist) will have no difference in adherences rates than individuals who did not consult with a healthcare professional.

H2: Individuals prescribed medications who possess health coverage will have no difference in adherence rates than those who do not possess health coverage.

H3: Individuals prescribed medication who experience adverse drug reactions (ADR) have a no difference in adherence rate with individuals who do not experience ADRs.

H4: Chronic disease patients who use medical monitoring devices that and measure vitals (blood sugar, blood pressure, etc.) for their illness have no difference in adherence rates to their prescribed drugs than those who do not use monitoring devices.

Significance of the Research

The implications of poor medication adherence are costly but can be prevented in the healthcare in America. Poor medication adherence poses a threat to two prevalent debatable subjects among a variety of stakeholders such as; key experts from consumers, and health providers in the medical enterprise, the growing economic burden and equal

quality of care for all patients (Bosworth, et al., 2007). The importance of this research will contribute to the general understanding of medication taking behavior. Adherence has been marginalized by the public because of its apparent lack of severity and seriousness in public health in America. Further comprehension with the behavior can be accomplished by investigating certain determinants that effect of medication adherence rates among patients. The study focuses solely on these determinants: adverse drug reactions, medical professional involvement, and blood pressure monitoring induced by self-efficacy. Health care professionals can utilize this information to help optimize drug regimens and lower cost for patients.

Delimitations

This study will not reflect medication adherence in the general population of Oklahoma. The study will not have excluded participants. The study will not have a larger sample size to reflect the general population. The study will not be focused on participants who have solely have chronic illness such as patients with hypertension (high blood pressure) and hyperglycemia (high blood sugar). This is due to limited access, time constraints, and resources to collect data from a wide-range setting.

Limitations

The study was a correctional cross-sectional study, limited to patients who receive care from an independent, family owned retail pharmacy. The study is limited to a three-day

data collection period due to time constraints and limited resources. All participants must be currently taking prescribed medication from a licensed healthcare professional and are required to be 18 years of age or older. These criteria remain to conduct the study in an ethical and functional manner. Several limitations of this study must be acknowledged. First, this study will be based its findings on the self-report survey, meaning that information from participants is subject to recall bias and socially normative answers. This method of collecting data from participants is a valid and reliable self-report instrument because they provide convenience and frugality with use in a clinical setting. The study was a correlational evaluation and thus does not suggest causality. Secondly, the study is limited in only displaying relationships between variables and the extent of those links (Brink & Wood, 2012). Finally, the study may have a small sample size (n=35), and participants were relatively homogenous, some influencing factors may not have been detected. Thus, medication adherence, self-efficacy, and white-coat adherence may be forecasting factors for managing chronic illnesses, for example, self-monitoring blood pressure, in a larger more heterogeneous sample of participants.

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CHAPTER II

MEDICATION ADHERENCE

The Scope of the Problem

Medications, from antibiotics to painkillers, have forever transformed our lives. Most research is centered on developing an exceptional benefit-to-risk profile for new drugs and not the health-related behaviors that extend beyond taking prescribed pharmaceuticals. Pharmaceutical therapy is one of the most common therapies practiced in medicine. Nearly seventy percent of Americans in the United States have taking at least one prescriptions drug in their lifetime (Mayo Clinic, 2013). Despite the benefits and effectiveness of prescription drugs, patients fail to take their medication as prescribed by the physician. As a result, patients suffer from the implications of poor adherence. The Center of Disease Control and Prevention (CDC) holds that Americans die annually due to poor medication non-adherence, approximately 125,000, and those numbers are rising with increasing use of pharmacotherapy (McCarthy, 1998; Centers for Disease of Control and Prevention, 2010). New England Healthcare Institute (NEHI) advocate that potential savings from adherence and related disease management could be 290 billion annually, which is approximately thirteen percent of healthcare spending in the U.S. (NEHI Research Brief, 2009). Medication adherence is a growing crisis, both economically and industrially, in the United States. Reducing barriers between adherence and patients can lower economic burden and increase optimal health outcomes for patients in the U.S.. We

must understand that as populations increase, illnesses rise, and growing use of pharmaceuticals makes medication adherence for patients and prescribers more pertinent and vital to the future of medicine (Brown & Bussell, 2011; Centers for Disease of Control and Prevention, 2010).

The Theory Behind Adherence

Medication-taking behavior has been attempted to be deciphered using multiple behavioral models. The multifactorial nature of the behavior makes adherence difficult to approach with a single intervention. There are more than 200 variables that correlate to medication adherence (World Health Organization Incorporated, 2003). These variables have been categorized into three categories the patient (beliefs, expectancies about health and treatment), patient's disease (chronicity, medication taken, complicating factors), and patient's relationship to the healthcare provider (Brawley & Culos-Reed, 2000). Nevertheless, self-monitoring perspectives, behavior capacity, and reinforcement concepts have been considered of central importance to understanding medication taking behavior (World Health Organization Incorporated, 2003). Theoretical models such as health belief model, protection motivation theory, the theory of reasoned/planned behavior are composed of key concept that has been defined as facts of the higher-order social cognitive theory constructs self-efficacy and outcomes expectations.

Medication adherence aligns profoundly with the construct of self-efficacy in the social cognitive theory because the theory encompasses the cognitive process behind adherence.

The Social Cognitive Theory (SCT) was proposed by a Standford University psychologist, Albert Bandura, in the 1980s. According to his theory, an individual's belief that one can adhere to taking medication as prescribed would be interpreted as self-efficacy. This element of self-efficacy in SCT stands as a fundamental construct and mediator that influences behavior. The construct of self-efficacy elucidates the complexities of medication-taking behavior.

The basic principle behind self-efficacy is the higher the self-efficacy, the more the individual will believe they are capable of completing a task. Thus, the lower the self-efficacy, the less the individual will believe they are capable of completing a task.

Self -efficacy holds a different denotation opposed to other homogenous terms, such as self-esteem and self-concept. Self- esteem and self-concept deal with a general concept about topics, whereas self-efficacy is defined as the attitude towards specific task in a particular context.

Self-efficacy holds four determining factors (*See Fig. 1)*. These factors are performance outcomes (or outcomes expectations), verbal persuasion (social reactions), vicarious experiences, and physiological feedback. Performance outcomes are experiences that can influence the ability of an individual to perform a given task. The experiences can be interpreted as positive or negative. These experiences influence an individual's ability to complete a specific task. For example, and individual taking isotretinoin (acme medication) may experience side effects, such as cheilitis (dry lips), and abstain from

taking their medications. However, an individual may also continue therapy as acme heals and scars disappear. Verbal persuasion influences self-efficacy through oral

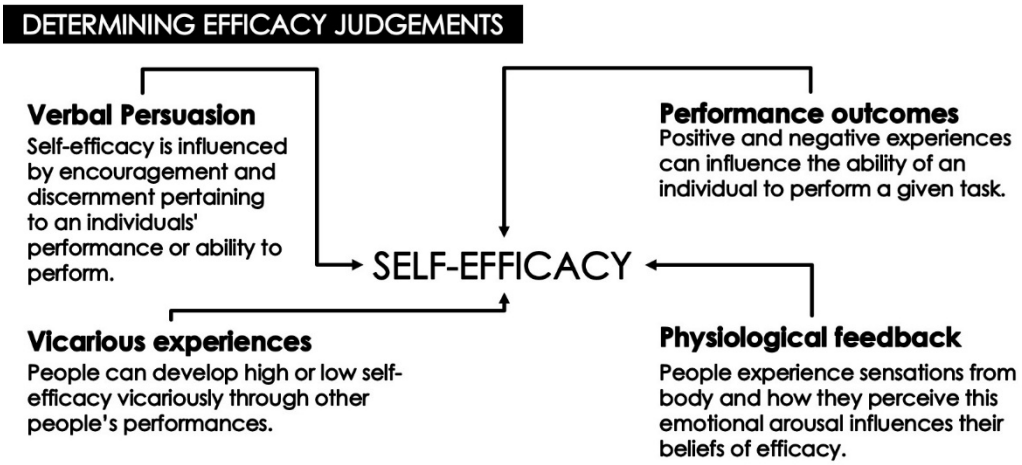

Figure 1 - Albert Bandura's Model of Self-Efficacy

encouragement and discouragement pertaining to the individual's performance. Coaching is a common form of verbal persuasion. Physiological feedback is described as sensations from the individual's body that add to their experience. How individuals perceive this emotional arousal influences their beliefs of efficacy. Lastly, people develop high or low self-efficacy vicariously through another person's performance. For instance, patients may observe a coworker in distress when taking an antibiotic and as a result feel they are just susceptible to the agony. All four contributors to the capacity of self-efficacy an individual may possess, depending on the magnitude of the four determinants.

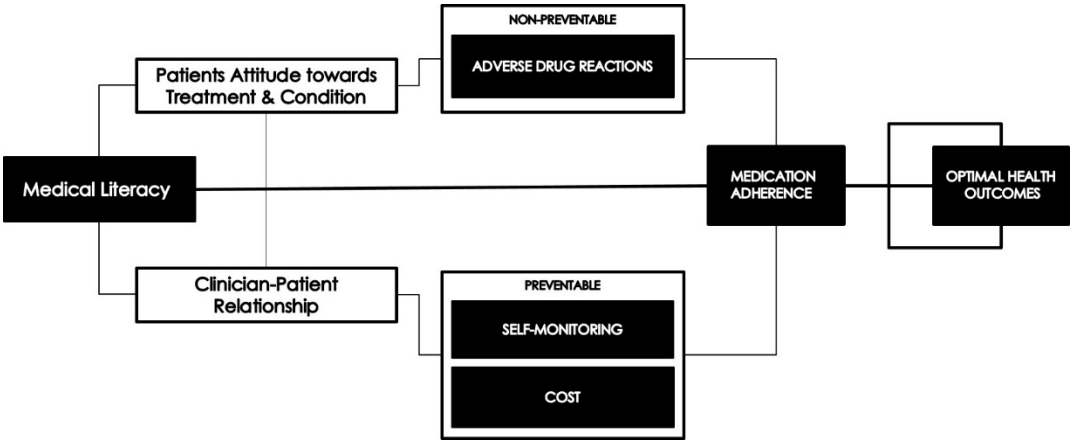

Figure 2- Behavioral Model for medication adherence amended for relevant constructs for investigation in study (above).

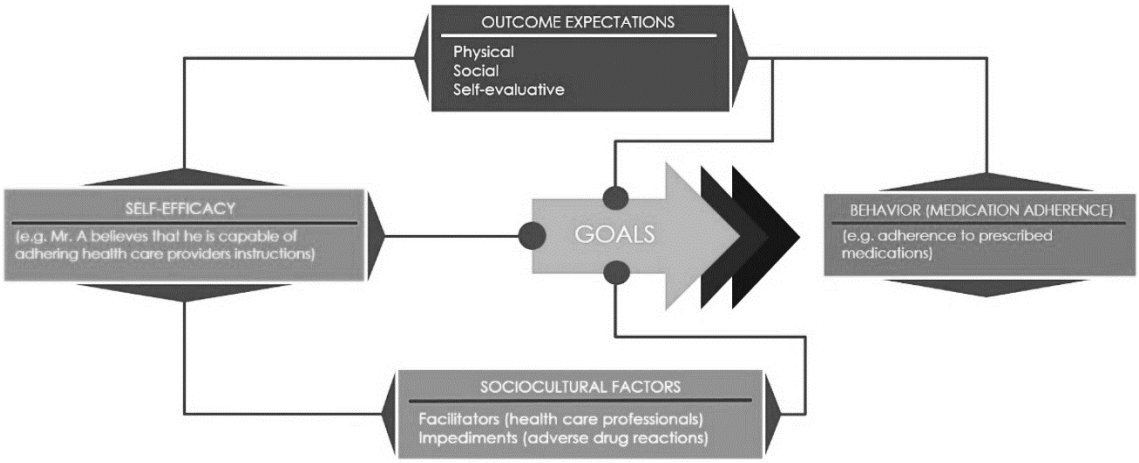

Figure 3- Albert Bandura's Theoretical Model of Self-Efficacy amended for medication adherence (above)

Albert Bandura's theoretical framework for self-efficacy explains the cognitive process behind medication adherence (*See Fig. 2 & 3*). According to Bandura's theory, a patients' belief that one can adhere to taking medication as prescribed (self-efficacy). This remains a fundamental concept and mediator that influence other ideas that affect adherence. A patient's self-efficacy influences one's expectation of outcomes from adhering to the

prescribed medication (outcome expectations), which then influences adherence. For example, with self-efficacy, patients expect adherence to medication to improve one's medical condition (physical outcomes, physiological feedback) expects to be supported by society (social reactions; health care professional approval), and expects adherence to medication to be self-satisfying (self-evaluative reactions). Outcome executions can also be seen a mediating role in adherence to prescribed medication, because, with these positive expectations, patients will likely adhere to prescribed medication. Patients also consider their environment (sociostructurally factors): a confident belief in one's capability to adhere (self-efficacy) enables him to identify facilitators of adherence in one's environment and to overcome various impediments ((ADRs) Adverse Drug Reactions). SCT proposes that positive perceptions of self-efficacy, outcome expectations, and sociostructurally factors (verbal persuasion) influence short-term goal setting and positive attitudes are reflected in higher attainable goals towards adherence.

Albert Bandura's SCT, concerning self-efficacy, traces out the cognitive process behind medication adherence and how the determinants under investigation may influence the behavior. His model for self-efficacy outlines direct relationships between medication adherence and impediments such as adverse drugs reactions. Furthermore, the framework shows how their beliefs can polarize outcome expectations, vicarious experiences, and physiological feedback about medication prescribed and influence medication adherence. The study aims to understand the dimensions of Bandura's determinants for self-efficacy and their applicability to medication adherence concerning essential barriers such as cost,

clinician-patient relationships, self-monitoring conditions, and adverse drug reactions, along with evaluating the associations between the barriers above and adherence.

The Clinician-Patient Relationship

Adherence with patients has been correlated with the quality of the relationship that patient have with their healthcare providers, particularly physicians and pharmacist (Brown & Bussell, 2011). The clinician-patient relationship is central to the practice of healthcare. The clinician-patient relationship is described as personal awareness of patients' unique personality structures (Fortin, Dwamena, Frankel, & Smith, 2012). It plays a vital role in the delivery of high-quality healthcare, both in the diagnosis and treatment of a disease or condition. The clinician-patient relationship shapes the foundations of contemporary medical ethics. (Goold & Lipkin, 1999) Susan Goold and Mack Lipkin, both medical professionals, have reviewed and studied the distribution of limited healthcare resources, exclusively from the views of patients and the public. Goold and Lipkin advocate that the clinician-patient relationship requires transparency and reciprocity between both parties. The medical care enterprise is an unfamiliar and multifaceted course for patients. Albert Bandura's Theory of Self-Efficacy postulates that patients can be influenced by the environment and subjective facilitators (e.g., friend). These factors may affect adherence and draw parallels between medication-taking behavior and quality relationships with physicians and other healthcare providers It is fundamental to understand the patient cognitive process throughout this healthcare

system. Healthcare providers should improve adherence by increasing positive verbal encouragement within communication. Positive verbal encouragement from providers can help patients navigate through the healthcare system with confidence and optimize their health outcomes (Raynor, et, 2007).

A cross-sectional study was done by Dr. Worth, and Dr. Pathman in Primary Medication Adherence addresses a correlation between medication adherence and communication among healthcare professionals. Wroth and Pathman studied the adherence among rural populations using a telephone survey (Wroth & Pathman, 2006). The results revealed that 3926 respondents that have received care the previous year, 894 (21.6%) reported that they had delayed or did not fill a prescription over a period (Wroth & Pathman, 2006). Researchers observed delaying or not filling prescriptions was more common among a particular group of people. These people were 65 years or younger, of African descent, reported incomes less than 25,000, and reported fair or poor health. Researcher point outpatients had issues due to a lack of confidence in their provider's ability to help them (Wroth & Pathman, 2006). Patients also described having a lack of satisfaction with concern shown them by physicians. Patients finally admitted to a lack of satisfaction with how welcome and comfortable they are made to feel by office staff (Wroth & Pathman, 2006). The data reveals the significance of physician-patient communication on medication-taking behavior and patient satisfaction (Wroth & Pathman, 2006).

Trends in medication adherence and patient-physician communication have been associated with the behavior phenomena, white coat adherence. White coat adherence is not salubrious for long-term therapies but shows a connection between healthcare professional's authoritarian symbol and medication adherence (Modi, Ingerski, Rausch, Glauser, & Drotar, 2013). Investigators identified the clinical visits as anchoring points for patients (Modi, Ingerski, Rausch, Glauser, & Drotar, 2013). However, this type of medication-taking behavior has inconsistencies. Researchers some intervals between clinic visits displayed increases adherence before and after visitations (Modi, Ingerski, Rausch, Glauser, & Drotar, 2013). This white coat adherence phenomenon discloses the magnitude of impact healthcare providers have on their patients. Thus, parallels can be drawn between adherence and patient-physician communication.

By what means patients value clinician-patient connection is vital to generating adherence to treatments. Thus, clinicians should allow patients to engage in the decision-making process regarding treatment. Understanding the presence and quality of the clinician-patient relationship from the patient's perspective is an auxiliary emphasis of the study. The study hypothesizes that patients who regularly encounter health care professionals (physician, pharmacist, radiologist, etc.) have higher medication adherence rates. The thesis will evaluate this clinician-patient relationship revealing the correlation among adherence rates. Communication between physicians and patient, along with the patient's knowledge of their condition and the selected treatment may provide the supportive environment and attitude to improve medication adherence.

Cost

In the study of adherence, the auxiliary emphasis is placed on the superficial determinants of medication adherence, such as cost-sharing. Cost sharing is defined as the share of the costs covered by an insurance policy and the beneficiary. The term includes deductibles, coinsurance rates, and copayments. This does not include premiums, balance billing amounts for non-network providers, or the cost of non-covered services (HealthCare.gov, 2017). According to the annual report on health insurance coverage from the Census Bureau, the uninsured rate dropped to 9.1 percent down from 10.4 in 2014. The number of American's without insurance also dropped, to 29 million from 33 million the year before (Rovner, 2016). Associations between adherence and different sources of health coverage will be investigated in the study. Also, the study will assess the association between adherence and cost-sharing to get a better understanding of the relationship between patient cost-sharing and medication-taking behavior. Studies concerning cost-sharing, health insurance, and adherence allow to investigators to understand how these determinants influence behavior. In a meta-analysis, a wide variety of interventions types, study populations, and sample sizes was summarizing to provide an estimate of the relationship between changes in cost-sharing and medication-taking behavior. For each dollar increase in patient copays, adherence (as measured by the studies) would be expected to decrease by 0.4 percent (Eaddy, Cook, O'Day, Burch, & Cantrell, 2012). For example, if a patient has a 20-dollar copay for a prescribed medication, adherence would expect to decrease by 6.8 percent overall. Albert Bandura's theory corroborates with

findings in the meta-analysis. Albert Bandura's theory does show that behavior can be influence by physical factors in the environment such as copayments. The "vicarious experiences" construct is logically applicable in these findings on cost sharing and adherence. For example, high copayments can be perceived as a burden. Neophyte patients may interpret this in the same manner, given the patient possess homogenous proclivities in behavior. with regards to this evidence, postulate individuals with health insurance will have no difference in adherences rates than individuals who possess coverage.

Adverse Drugs Reactions

Adverse drug reactions (ADR) are among one unavertable reason patients modify their drug regime and discontinue their therapy. Adverse drug reaction (ADR, or adverse drug effect) is a comprehensive term referring to unwanted, uncomfortable, or dangerous effects that a drug may have (Marsh, 2016). Adverse drug reactions can be considered a form of toxicity; toxicity is most commonly applied to effects of over-ingestion (accidental or intentional) or to elevated blood levels or enhanced drug effects that occur during appropriate use (e.g., when medication metabolism is temporally inhibited by a disorder or another drug). The term *side effect* is imprecise. Often the term is used to refer to a drug's unintended effects that occur within the therapeutic range (Marsh, 2016).

ADRs have the potential to become severe and unpredictable. There are three types adverse drug reactions allergic dose-dependent, and idiosyncratic adverse drug reactions.

Most adverse drug reactions are dose-related meaning these drugs possess a narrow therapeutic index, such amiodarone (an antiarrhythmic agent). Other ADRs are allergic or idiosyncratic. Allergic ADRs are not dose-related and require prior exposure. Allergies develop when drugs act as an allergen or antigen. After patients are sensitized, subsequent exposure to drug produces one of several different types of allergic reactions. Clinical history and appropriate test can sometimes help predict allergic ADRs (Marsh, 2016). Dose-related ADRs are commonly predictable; ADRS unrelated to dose are unpredictable. All medications carry the potential risk of adverse reactions. In the US, 3 to 7 percent of all hospitalizations are due to adverse drug reactions. ADRs occur during 10 to 20% of hospitalizations; about 10 to 20% of these ADRs are severe (Marsh, 2016). Adverse drug reactions from medications can deter a patient from continuing their treatment or make modifications to subside the side effects (Farlex Partner Medical Dictionary, 2012).

A link between medication adherence and adverse drug reactions for an antiretroviral medication was studied among HIV patients. The most common adverse effects of the Highly Active Antiretroviral Therapy (HAART) are gastrointestinal (O'Brien, Clark, Besch, Myers, & Kissinger, 2003). Anorexia, nausea, vomiting, and diarrhea are common side effects experienced by patients taking this medication. These adverse drug reactions have consistently lead to decreased adherence. HIV patients receiving HAART therapy engendered a level of adherence that was less than 80 percent of 46 percent of the sample population, 80-95 percent less adherent among 28 percent of the population and

95 percent less adherent among 26 percent of the population (Rajesh, Sudha, Varma, & Sonika, 2012). The non-adherence may result from patients self-adjusting their regimen due to adverse side effects and the toxicity of the drug or discontinued their therapy. With HAART another side effect is lipodystrophy, Kasper and colleges found that 37% of their respondents stopped their treatment or changed medication because they developed lipodystrophy (Rajesh, Sudha, Varma, & Sonika, 2012). Even of those who were adherent in the study, 57 percent seriously considered discontinuations of their therapy. Harsh adverse effects can steer patients to sporadic adherence and discontinuation of therapy.

In a recent study, 876 individuals diagnosed with schizophrenia, displayed what could be a possible pattern of non-adherence among patients experiencing side effects due to excessive weight gain and cognitive impairment (DiBonaventura, Gabriel, Dupclay, Gupta, & Kim, 2012). The majority of the schizophrenic patients experienced at least one side effect, 86.19 percent. Nearly, 42.5 percent Patients reported a complete adherence to their medications. Nearly a quarter (22.3%) of these participants reported discontinuing their treatment because these patients "felt worse" than before, only after taking the prescribed medication. The side effect data is clustered into a single model. In those clusters, extrapyramidal symptoms (EPS)/agitation (OR)= 0.57, P = 0.0007, sedation/cognition (OR = 0.70, P = 0.033), prolactin/endocrine (OR = 0.69, P = 0.0342), and metabolic side effects (OR = 0.64, p= 0.0079), all displayed a correlation between adherence rates and side effects. The data revealed lower adherences significantly

reduced with side effects (DiBonaventura, Gabriel, Dupclay, Gupta, & Kim, 2012). In the study reported that patients with complete adherence to their medication were significantly less likely to report a hospitalization for a mental health reason (OR = 0.51, p = 0.0006), hospitalization for a non-mental health reason (OR = 0.43, p = 0.0002), and an emergency room visit for a mental health reason (OR = 0.60, p = 0.008). Among patients with schizophrenia (DiBonaventura, Gabriel, Dupclay, Gupta, & Kim, 2012). Medication side effects are highly prevalent and stand as significantly associated with medication adherence. Non-adherence was significantly associated with increased healthcare resource use. Identifying medication-induced side effects, using preventive strategies to effectively manage these side effects will increase medication adherence, reduced healthcare resources, and optimize health care outcomes.

Most patients are not well-informed about the ADRs medications hold. One study evaluates this very issue. In this study, 264 patients with a valid prescription from their prescriber were asked to answer various questions about their medication in a questionnaire. Patients responded to queries concerning side effects poorly. When the patients were asked "Which, side effects may occur," 86.74 percent, nearly nine out of ten, patients answered incorrectly (Singh et al., 2013). Overall only thirty –five patients (13.26 %) knew about the side effects produced by their medication, and fifteen (5.68%) knew about how to recognize them (Singh et al., 2013). Healthcare providers find it important bridge the gap acknowledge concerning ADRs to avoid the skewed judgment of their treatment. Bandura's social cognitive theory alludes that particularly various

experiences with ADRs are communicable. For example, if one individual perceives there medications as harmful without formal address by a healthcare provider can hinder medical literacy in population. These experiences can hypothetically be triggered by physiological feedback from ADRs. This illiteracy about ADRs contributes to the poor judgement of self-efficacy, thus decrease in adherence.

Healthcare providers can dissuade poor adherence among patients by being sensitive and responsive to individual vicarious experiences and physiological feedback with prescription medication adverse drug reactions. Adverse drug reactions serve as a formidable barrier against adherence. The study will assess the presence of the ADRs and their association with medication-taking behavior. The study postulates that patients who take prescribed medications who do not experience adverse drug reactions (ADR) have no difference in adherence rates than those commonly experience adverse drug reactions. The association between adherence and ADRs will enhance the understanding of the cognitive process of medication-taking behavior.

Self-Monitoring Blood Pressure

Patients who self-monitor their health conditions during treatment have been shown as a remedy to prevent poor adherence (World Health Organization Incorporated, 2003). The American Heart Association recommends that patients with high blood pressure (HBP) monitor their blood pressure at home to allow physicians optimize treatments for them (American Heart Association, 2014). Home blood pressure monitoring (HBPM) helps the

patient and physician know if the treatment being given is efficacious. Recording blood pressure daily provides a time-lapse picture of the selected treatment. This time-lapse picture helps doctors eliminate any possibility of false readings during clinical visits and observe any profound developments during the patient's therapy (Brown & Bussell, 2011).

Medication adherence has been shown to develop with increase self-efficacy using a monitoring device. Self-efficacy can be improved by providing patients, particularly with chronic conditions such as hypertensive patients with electronic blood pressure cuffs (sphygmomanometers) to provide daily readings on blood pressure (American Heart Association, 2014). Professional and personal monitoring through clinical check-ups have increased adherence among patient. In 2013, Breaux-Shropshire and Brown conducted a cross-sectional study on the relationship between blood pressure and medication adherence among a population of municipal workers with access to healthcare. Breaux-Shropshire and Brown conducted a cross-sectional study with 149 municipal employees. Approximately one-third of participants have been diagnosed with hypertension, and nearly half have some college education and take antihypertensive drugs to manage their HBP. The mean scores for medication adherence and medication adherence self-efficacy were of adequate range (5.97 to 6.07 and 3.44 to 3.57, respectively) (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). Those patients with uncontrolled blood pressure scored a mean of higher (6.07) than those who had controlled blood pressure (5.97) (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). Those were

homogenous with results for the medication adherence self-efficacy (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). Significant findings in this study demonstrated a direct relationship between medication adherence and medication self-efficacy ($r = 0.549$, $p < .001$) (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). It should be noted that the participants in this study who participated in self-monitoring their chronic conditions improve their adherence and achieve optimal health outcomes (World Health Organization Incorporated, 2003).

Nevertheless, parallels between self-monitoring equipment and individual approaches were not examined in a meta-analysis. Outcomes from the studies encompassed the meta-analysis were not homogenous (Artinian et al., 2007). Nancy Artinian, a professor, and nurse with extensive clinical expertise, found a statistically significant reduction in systolic blood pressure among participants who self-monitored their blood pressure through a 12- month period (Artinian et al., 2007). The discrepancies between these studies may be attributed to differences between different aspects considered (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). The study measured community-based self-monitoring, whereas this study observed home-based self-monitoring (Artinian et al., 2007, Breaux-Shopshire, Brown, Pryor, & Maples, 2013). Medication adherence self-efficacy did not predict blood pressure control due to the lack of variability with the study (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). Nearly 48 percent of participants before the study had high medication adherence self-efficacy with 23 having medium medication adherence self-efficacy (Breaux-Shopshire, Brown, Pryor, & Maples, 2013).

Other factors that diminish variability in this study were the lack of questions on potential barriers to medication adherence (e.g. drug cost and adverse drug reactions) (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). Medication adherence and medication self-efficacy have a positive direct relationship (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). Education and age were also positively correlated with medication self-efficacy (Breaux-Shopshire, Brown, Pryor, & Maples, 2013). This relationship shows medication adherence may be improved with self-regulation of these chronic conditions using medical devices that help with home monitoring (Breaux-Shopshire, Brown, Pryor, & Maples, 2013).

Reviews and meta-analysis on basic elements of medication-taking behavior and self-regulation reveal inconsistencies (Ebrahim, 1998). A meta-analysis on adherence and self-regulation suggest that evidence for the effect of SMBP on lifestyle change and medication persistence is scarce, of poor quality, and proposes little clinically relevant benefit (Fletcher, Hartmann-Boyce, Hinton, & Mcmanus, 2015; Breaux-Shopshire, Brown, Pryor, & Maples, 2013). The investigators enquired if home blood pressure monitoring (HBPM) increases blood pressure control (Ogedegbe & Schoenthaler, 2006). A recent meta-analysis investigates a connection between medication adherence and personal blood pressure management.

The Journal of Hypertension (Greenwich), investigators, conducted a systematic review to access the evidence from published randomized controlled trials (RCTs) on the

relationships between medication adherence concerning antihypertensive drugs and HBPM among patients (Ogedegbe & Schoenthaler, 2006). The review uncovered 11 studies that focus on HBPM, self-reports, pill counts, pharmacy refills with medication adherence as an assessed outcome. In the analysis, 11 RCTs met predefined criteria reporting statistically significant improvements in medication-taking behavior. Nearly half of the RCTs in this review reported statistically significant positive correlations between medication adherence and HBPM interventions employed and the usual care. It should be noted that though the study was extensive, some RCTs may have been missed. Most responses that were reviewed contain small sample sizes that were less than 70 patients. Only 82 percent RCTs allow the investigators to assess the independent effects of HBPM and adherence. Only three were conducted in primary care practices where most hypertensive patients receive care (Ogedegbe & Schoenthaler, 2006). The findings in these studies have been shown to be consistent in other studies assessing self-efficacy and health outcomes. One study estimates self-efficacy among a sample of diabetic patients (Hernandez-Tejada, et al., 2012). The results displayed significant correlations with empowerment about medication adherence ($r=0.17$, $p<0.003$) and blood sugar testing ($r=0.12$, $p=0.043$) (Hernandez-Tejada, et al., 2012). The collected data suggests that empowerment was related to better diabetes knowledge, medication adherence, and self-care behavior (Hernandez-Tejada, et al., 2012). Overall, data from this review shows that effects of HBPM and patients' medication-taking behavior remain mixed. With 54 percent of the RCTs review reporting significant improvements in adherence to

interventions and usual care (Ogedegbe & Schoenthaler, 2006). Most patients who consume hypertensive medications are elderly and stricken by other supplementary chronic health conditions, such as hyperlipidemia, osteoarthritis, and diabetes mellitus type II.

Medication adherence and self-monitoring are associated with one another according to Bandura's SCT. Bandura elucidates in his theory that physiological feedback and self-efficacy is linear. In the context of medication adherence, adherence can be established with the internal belief that the medication taken for their conditions is effective by monitoring the changes. This according to theory, monitoring can evoke an emotional arousal that is consistent manner thus increasing the magnitude of self-efficacy to complete the specific task of taking their medication as prescribed. Monitoring can reassure the patient that their medication is effective and help the individual gain a better understanding of the treatment and condition. The survey will ask participants questions to determine the relationship between self-monitoring blood pressure and adherence. The study hypothesizes that chronic disease patients who use medical monitoring devices that and measure vitals (blood sugar, blood pressure, etc.) for their illness become have greater adherence to the following prescribed drugs. Chronic disease patients who use medical monitoring devices that and measure vitals (blood sugar, blood pressure, etc.) for their illness have higher adherence to their prescribed drugs.

CHAPTER III

METHODS AND MATERIALS

Participants

The participants that will be part of this study will be retail pharmacy patients in the Edmond, Oklahoma. Each participant will receive a packet containing a consent form and a paper-based survey. Participants will be instructed to read informed consent document to concede to consent before concluding the paper survey. The informed consent and paper survey will take approximately 5 minutes to complete and will be provided in large font and at an eighth-grade reading comprehension level. Participants will not be asked for any identifying information, and a waiver of signed informed consent will be requested from the institutional review board at Oklahoma State University. Participants will be asked to return the completed packet, regardless of participation. Participants will receive five-dollar gift cards for completion of the survey.

Instruments

The study will be conducted through a demographic questionnaire along with one empirically tested questionnaire namely the Morisky Medication Adherence Scale survey (Morisky, Levine, Shapiro, Russell, & Smith, 1983). Other surveys will be synthesized researcher and reviewed and translated by graduate students.

Demographics

The demographic questionnaire will ask questions about age, race, ethnicity, marital status, employment status, quality of insurance, and household income. The background information about the participant will be asked in the demographic questionnaire. The survey will help identify the type of population that will be used in the study and create subcategories based on demographic information.

Morisky Medication Adherence Scale

The Morisky Medication Adherence scale will be used to measure medication adherence, the individual's self- report of compliance taking chronic illness drugs. The core uniformity of Morisky Medication Adherence Scale was assessed using Cronbach's alpha coefficients (Breaux-shropshire, Brown, Pryor, & Maples, 2013). This approach is commonly used to determine the homogeneity of an instrument (Polit & Beck, 2004). The Morisky Medication Adherence scale liability was reported to be at .74 (Darren & Mallery, 2003). Medication adherence self-efficacy, individuals' confidence in adhering to routine drug rituals was measure by the revised Medication Adherence Self-Efficacy Scale (MASES-R).

Self-Monitoring Using Medical Devices and Adherence

The self-monitoring survey will be measured using a survey generated to ask questions concerning the use of medical devices and medical and medication adherence. This survey will ask participants to self-rate how they have felt about using their devices and

whether these devices aid in adherence with medication. The are no studies have demonstrated these survey questions a have strong reliability.

Adverse Drugs Reactions and Adherence

Adverse drugs reactions moiety of the survey will be measured by using a questionnaire developed by the researcher. The questionnaire is nine-item survey based on a Likert scale. This survey asks the participants to self-rate their experience with medications adverse drug reactions and healthcare professional supervision. No studies have confirmed strong reliability with this nascent test.

Procedures

Surveys will be distributed a local retail pharmacy. The paper survey will be circulated without exclusions. The study continues for three consecutive days and will be incentivized with five-dollar gifts from the pharmacy to allow for adequate sample size and statistical power for this study. The participants will be asked to complete all the surveys and return them to the retail pharmacy manager and personnel. All surveys that are fully completed and returned will be used for data collection.

Statistical analysis

Pearson's chi-squared test (X2) will be calculated to determine the cumulative probability of adverse drugs reactions, self-monitoring using devices, coverage, and demographics and how it relates to the medication adherence. The chi-squared test will be able to

determine the discrepancies between the expected results based on the hypothesis and the actual results

CHAPTER IV

FINDINGS AND DISCUSSION

The survey elaborates using different groups of individuals who vary in mutable interest but shared other features in its methods to gauge any correlations between medication adherence, ADRs, and blood pressure monitoring using data collected for consumers an independent, family owned pharmacy serving a middle to high class socioeconomic population. The study was complete over three consecutive days during the pharmacy's regular business hours. Overall thirty-six participants were recruited in the study. Small sample size may have weakened findings during data collection. The frequencies for the demographics, blood pressure diagnosed patients, and medication adherence are

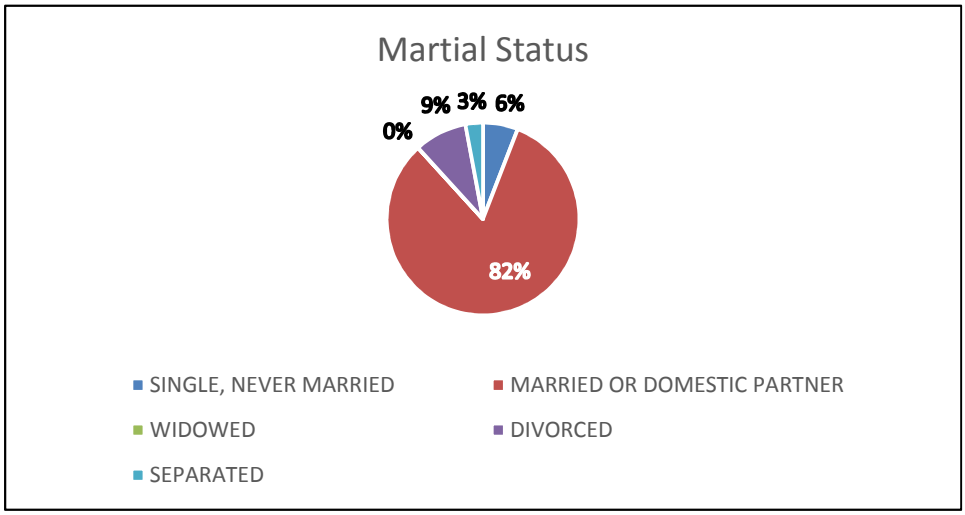

Figure 4 - Martial Status Frequency in study.

presented in figures (*See Fig. 4-11*). Frequencies for ethnicity and race were not included in the study.

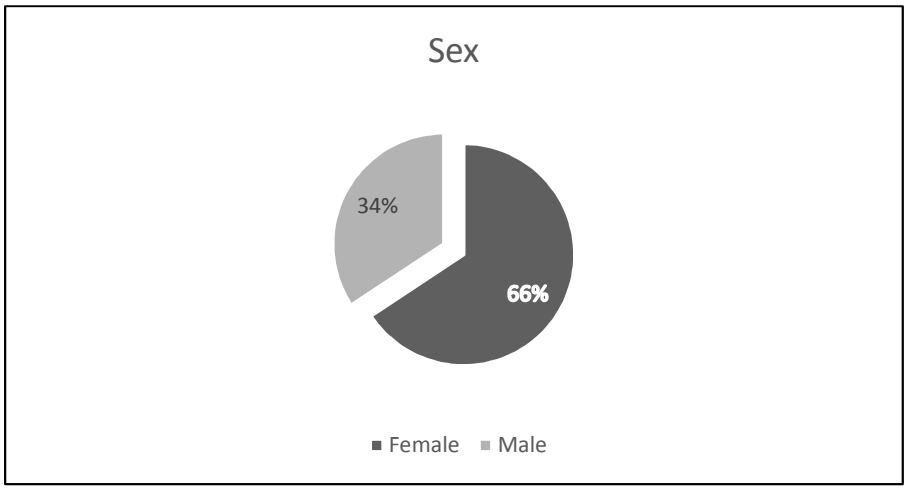

Figure 5 - Sex orientation frequency in study.

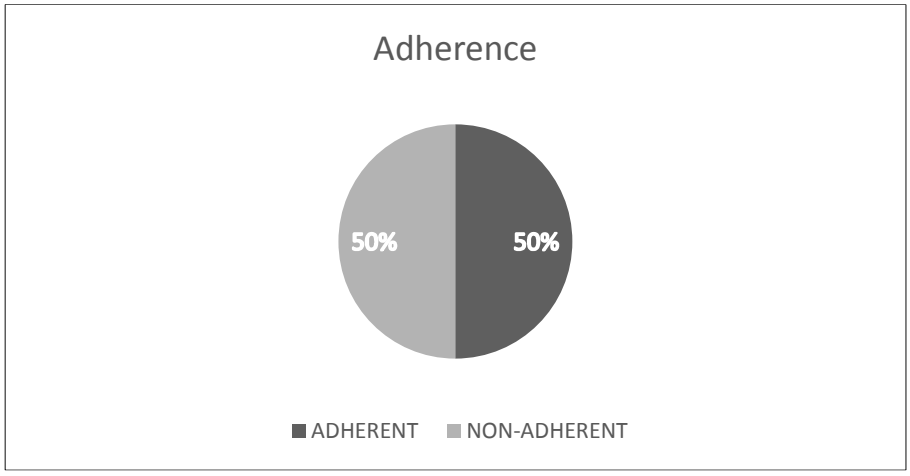

Figure 6 –The medication adherence frequency in study.

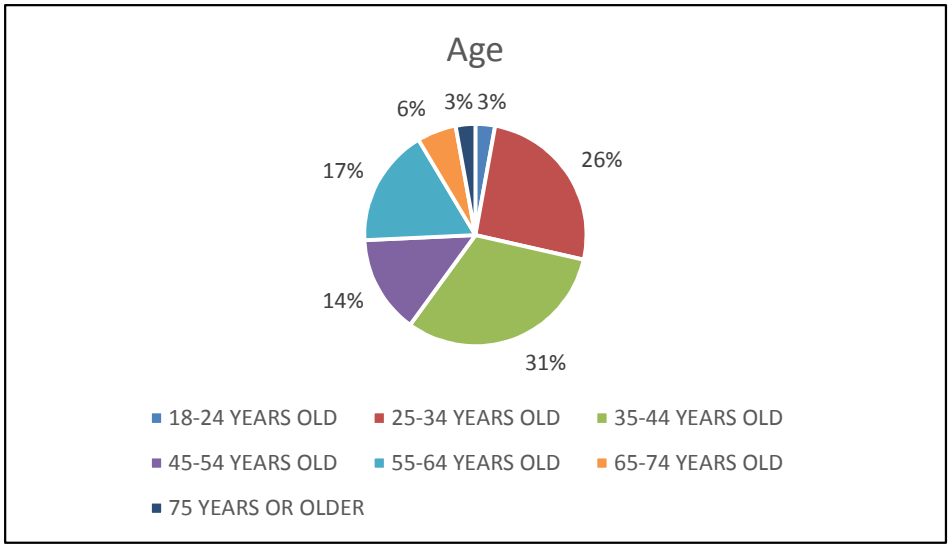

Figure 7 - The age frequency in the study.

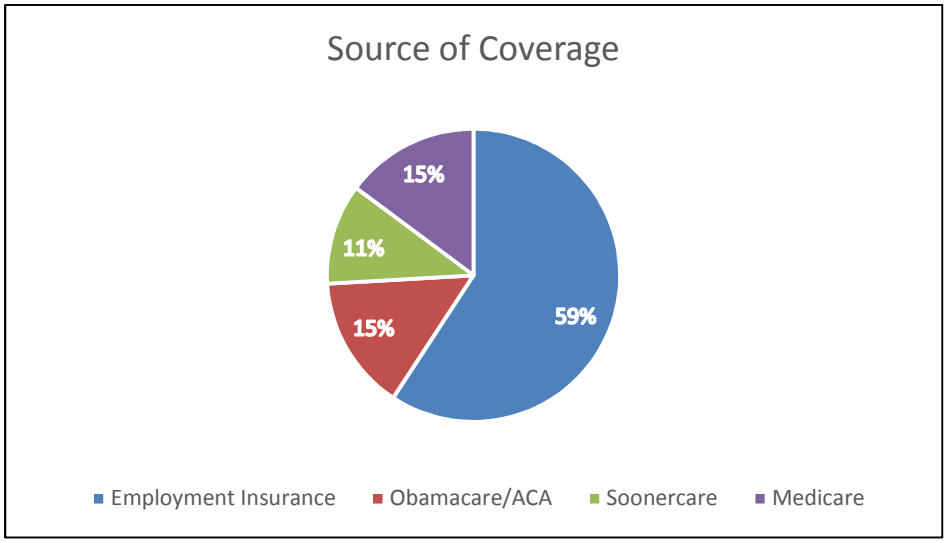

Figure 8 - The source of health coverage frequency in the study.

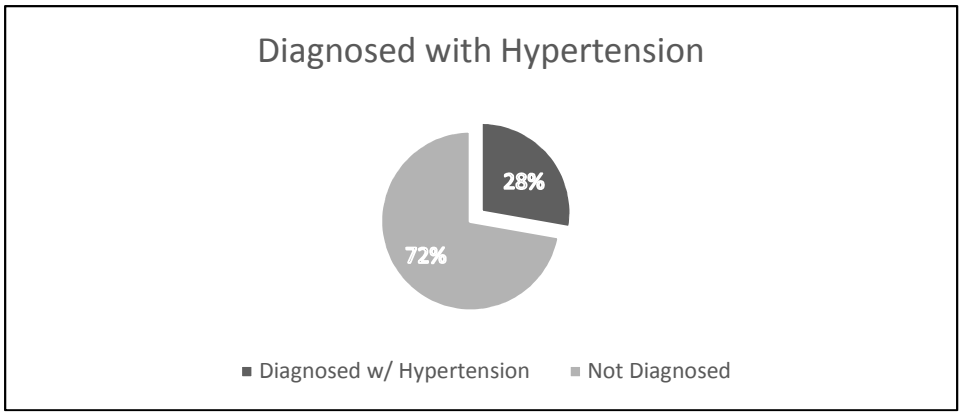

Figure 9 - The frequency of individuals that have been diagnosed with hypertension by a certified healthcare provider.

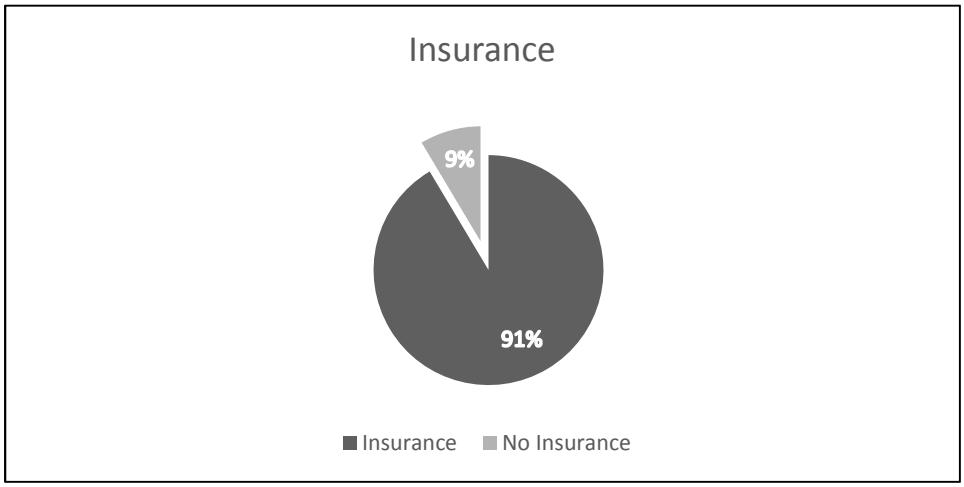

Figure 10 - The frequency for health Insurance in the study.

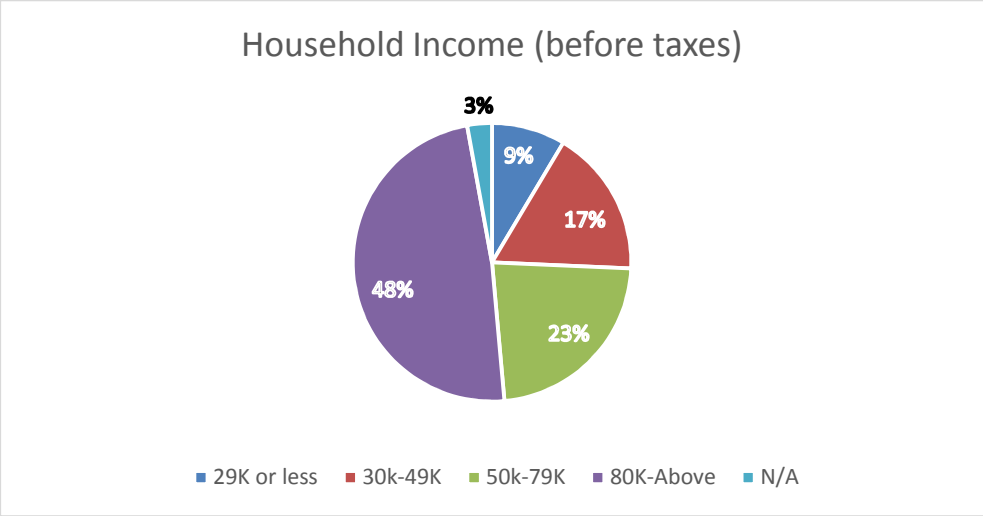

Figure 11 - Household Income, before taxes, frequency for the study.

When preforming the statistical analysis, the chi-square statistical method was chosen. This method was chosen due the applicability and common use with cross-sectional correlation studies. Some individuals did not answer all questions, and as a result were jettison from the study. The sample was homogenous, not much diversity among participants. The participants scored an average of 71.39 on the Morisky Medication Adherence Scale. If participants scored above 70%, they were considered adherent. Approximately 50% of the participants in the sample were adherent to their prescribed medications. Conferring to chi-square statistics, individuals who consumed medication with insurance displayed no difference in adherence rates in without insurance ($p>0.05$, $w = 0.87$). Furthermore, data reveal no significant differences between sources of health coverage and adherence rates ($p>0.05$, $V=0.18$). The study failed to reject the null hypothesis for adherence and adverse drug reactions. In the sample we observed no

difference in adherence rates among individuals who have experienced adverse drug reactions than those who have not experienced adverse drug reactions with prescribed medication ($p>0.05$, $w=0.67$). Due to lack of data; the study failed to find any association between clinician-patient relationship, ADR, and medication adherence; concomitantly. These results were analogous to findings for participants evaluated on blood pressure monitoring or charting skills. The results disclose that there was no difference in adherence rates under individuals who monitor their blood than individuals who do not ($p>0.05$, $V=0.18$). When observing and comparing demographics, no difference was present within the sample in adherence rates. There was no correlation between adherence and age ($p>0.05$, $V = 1.13$), marital status ($p>0.05$, $V= 0.26$), current annual household (before taxes) ($p>0.05$, $V= 0.94$), and sex ($p>0.05$, $w=0.49$). A larger

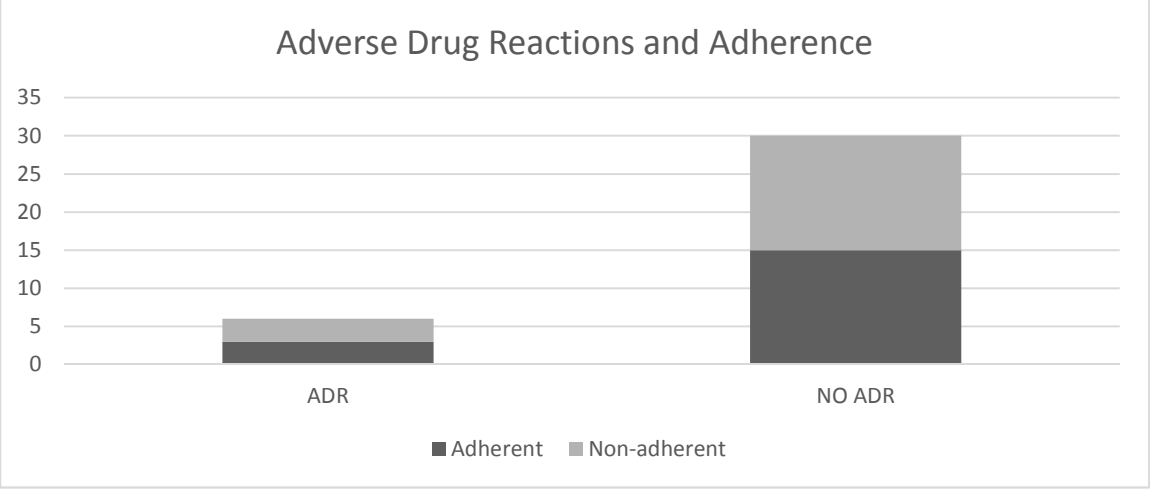

Figure 12 - The graph illustrating the association between adverse drug reactions and medication adherence.

sample size is needed for more statistical power to accurately represent the population of consumers from the independently owned pharmacy in the middle-high class population.

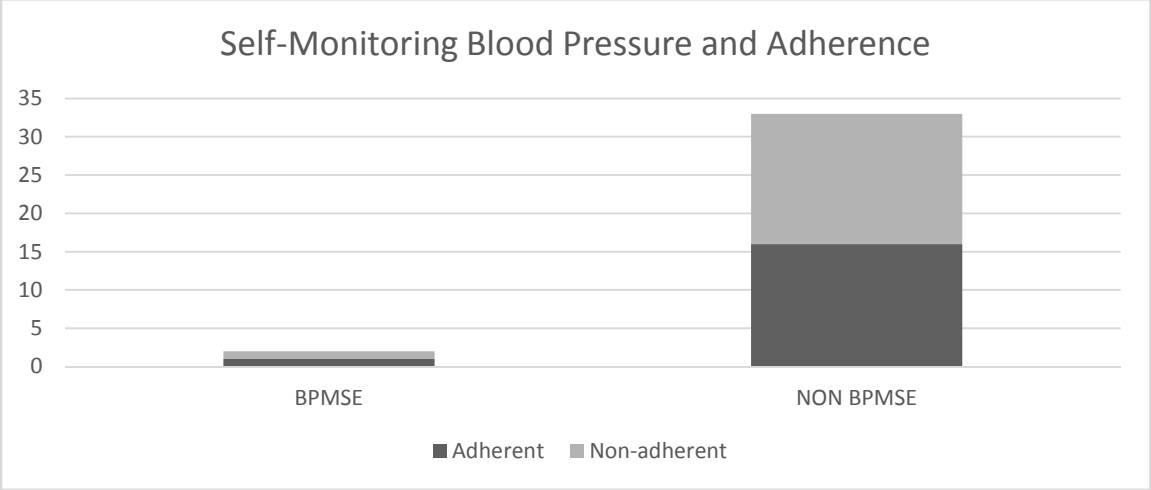

Figure 13 - The graph reveals the association between self-monitoring blood pressure and medication adherence.

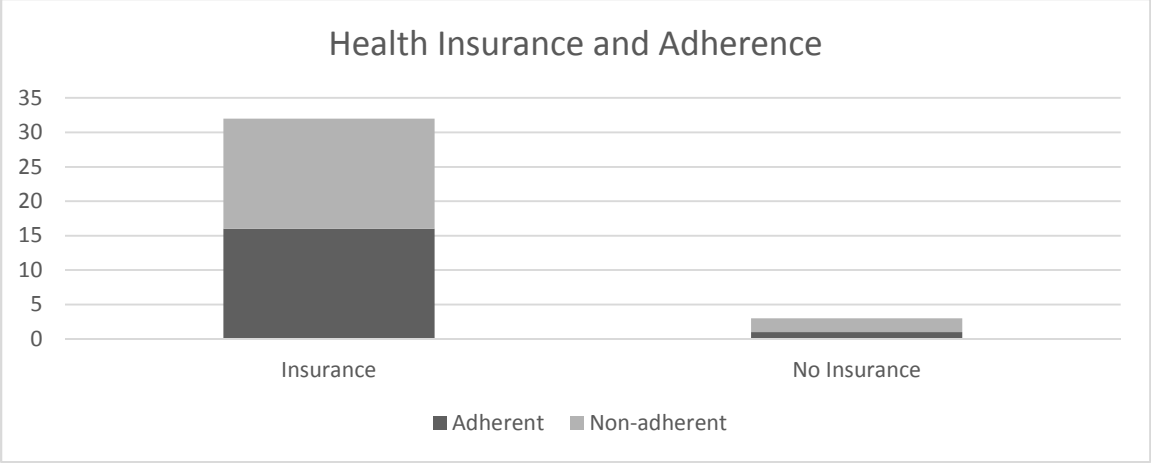

Figure 14 -The graph reveals the association between health insurance enrollment and medication adherence.

The study's incorporation of the Morisky Mediation Adherence Scale scores did reflect adherence percentages (approximately 50%) analogous to findings in the literature (World Health Organization Incorporated, 2003; Brown & Bussell, 2011). The scales used to measure self-monitoring, and charting of blood pressure and adverse drug reactions require rebuilding to obtain additional data and accurate assessment. The weak survey areas in the organization of questions and navigational and time-saving techniques designed for the participants taking the survey. The weak areas may contribute to the low yield of answers in particular sections of the survey.

During the three consecutive days of data collection, some surveys were not completed. Participants were asked to complete the survey as directed under the supervision of the principal investigator. In the study, only four participants were not adequately supervised, and surveys were not properly reviewed in the section composed of the Morisky Medication Adherence assessment. Some individuals turned in surveys to the pharmacy and skipped individual questions in this section.

The survey contains two questions in the first section (SECTION 1- Adverse Drug Reactions) related to the clinician-patient relationship and adverse drug reactions

hypothesis. The questions are followed-up by questions first concerning their experience with adverse drug reactions. Often participants reported not experiencing adverse drug reaction with their prescribed medication. The subjects were instructed to proceed to the next section in the survey. This design in the survey left the questions of concern answered only by a few participants. Data collected, from the few participants who answer these questions, did not suffice for utilization in concluding.

During data collection and observations, the participants seem to have struggled in navigating through the survey. During reviewing and scoring of the survey, often abstract markings were made and written saltatory action cues were ignored. Participants move to each question, skipping questions and sections of the study. Inquiries in the investigation left some participants vexed, due to limited choices that did not necessarily resonate as their answer. The questions should be reorganized in a manner that has a gradual transition from one question to another. Also, improving the practical mechanisms of the survey should include focusing on developing quick cognitive appraisals of each question. Reconstructing questions to be more recognizable may incur a more accurate and lucid response from participants. For example, "When taking medication do you experience the following: side effects…issues with refilling prescriptions…issues with talking to your health care provider?" The participant would review the following selections and check all that apply, opposed to asking each question individually. Improving functional devices such as proper organization and phrasing of the questions in the surveys may increase precision and accuracy in data.

CHAPTER V

CONCLUSION

Medication adherence is influenced by a multitude of factors, illustrating the complex and individual character behind this behavior. Albert Bandura's Social Cognitive Theory's construct of self-efficacy is a valid framework for understanding the complex and personal nature of medication adherence. Discerning the determinants of adherence can aid health care professionals, enhance care for their patients, and placate pecuniary expenses in healthcare enterprise. The study of medication adherence is an emerging subject of concern in the health industry. Stakeholders are beginning to understand some of the increasing economic burdens that exist in this sector. Furthermore, both stakeholders and healthcare professionals, with understanding the implications of the rising financial load, cannot optimize pharmacotherapeutic care solely through the benefit-risk profiles of medication, but from adherence of the patient receiving the drug.

The focus of the study was to discover correlations between three determinants: adverse drug reactions, self-monitoring of blood pressure, health care professional encouragement, and adherence. The study reveals adherence is not linear to the selected determinants or demographics. This suggest that other factors may play a larger role in adherent behavior. Nevertheless, given the small sample size and limitations of the study, a larger sample size is required to accurately reflect the population of consumers in

family-owned, independent pharmacies in Oklahoma. For future research, objective (e.g. pill counting and pharmacy refill records), biochemical (e.g. serum drug levels), and further subjective measurements (e.g. family members observance via survey) must be used and equated to obtain an accurate and precise assessment of core determinants of medication adherence. Incorporation of all three measurements of adherence give investigators a more fluid and functional standpoint in gaining a better understanding of medication adherence. Research in the future should engender approaches to reveal an association between medication-taking behavior and health outcomes.

A systematic review discloses that conducted interventions for home blood pressure monitoring (HBPM) in primary care settings were not effective compared with those that occurred in hospital-based clinics or nonclinical settings (Ogedegbe & Schoenthaler, 2006). The data on the effects of HBPM on patients' medication-taking behavior were shown to be mixed. Future studies should investigate the independent effects of HBPM in primary care practices where many hypertensive patients receive their care (Ogedegbe & Schoenthaler, 2006). These studies address the issue by advising future studies to be conducted in primary care setting and reveal an association between optimal health outcomes and adherence.

The study influenced by limitations to recruiting individuals from a pharmacy. Alternative settings in future studies should be explored. Pharmacy is limited to individuals who are adherent to a degree. I hypothesize that patients in a pharmacy are

more likely to be more adherent to medical advice than patients in a clinic-based or community-based sample. Studies to validate the assumption will support future studies.

Alternative theoretical frameworks are essential in gaining clarity to the complexity of the cognitive process behind medication adherence. One applicable theory for the elucidation of medication taking behavior is the Theory of (reasoned) Planned Behavior. The Theory of Reasoned Behavior is model for behavioral intentions. This model is congruenent to evidence of behavioral intentions given the determinants and the intricacy behind the medication-taking behavior. This theory has been attenuating by Icek Ajzen's extended model, the theory of planned behavior, which attempts to describe behavior and attitude using the construct of perceived behavioral control. (Ajzen, 1991) This model of the theory of planned behavior explains how an individual's behavior is directly related to belief. Whereas individuals can "control" their behaviors. There are three fundamental constructs of this model that explain and describe the apparent behaviors and ability of own to exert "self-control" behavioral intentions influence by one's attitude or self-evaluation of behavior (what I think), subjective norm (what others think), and perceived control behavior (what I think and what "should" to do, considering the subjective norms and beliefs and self-behavior evaluation) (Ajzen, 1991). The theoretical model of self-efficacy explains how specific determinants may influence individual intentions. The theory of planned behavior possesses a construct, perceived control behavior. This construct is derived from Albert Bandura's theory of efficacy (Ajzen, 1991). This theoretical framework may dispel influencing factors behavior intentions, and cognitive

process oppose that lead to medication adherence, optimal health outcomes, and eventually a better quality of life.

Poor medication adherence is complex to combat. Furthermore, poor adherence has deleterious implications for patients who are not adherent to their prescribed medications. Healthcare professionals and stakeholders are becoming more aware of medication-taking patterns of patients and interventions to combat poor adherence are in development. Many responses are using a more technological approach to decreasing the perils of medication non-adherence. Electronic wireless devices such as pill bottles and trackable pills may aid in mollify pill-taking regime, but experts express that it not a cure for poor medication adherence among patients. Dr. Niteesh Choudhry, an internist at Harvard Medical School, conduct a study to get a clearer understanding of these devices and the association with medication adherence (Silverman, 2017). Dr. Choudhry conducted the investigation to assess the efficacy of the smart bottle; required synthesize a device of his own. The device included a "Timer cap" to aid as a reminder to take daily doses of the medication. Dr. Choudhry also found to differences in adherence among those who use conventional weekly pill boxes (Silverman, 2017). Many critics point out that the new technology has potential to be abused and heavily relies on individual volition.

Other technologies have been utilized to improve medication adherence among patients. The Food and Drug Administrations (FDA) regulators have approved the first pill that can be digitally tracked through the body. The drug Abilify® MyCite is an aripiprazole tablet. Aripiprazole is a drug used for treating schizophrenia and manic episodes. The pill is equipped with an ingested sensor embedded inside the tablets that indicate that medication has consumed. Schizophrenic patients where a patch that transmits data to their smartphone (Abderrahman, 2017). Many healthcare professionals find this information useful. However, many agree that the information in the wrong hands may become more harmful than beneficial for patients and healthcare professionals.

The problem with medication adherence is the complex and individual nature of the behavior. These two characteristics make medication adherence empirically multifactorial. Patients are non-adherent to medications for a multitude of reasons, many amendable but influenced by the environment. Thus, practical interventions on medication adherence should be specific for a patients' disease or condition, treatment, and other determinants that effect solely those patients (Ogedegbe & Schoenthaler, 2006). Smart bottles placate common medication-related behavior issues that often come to surface, such as forgetfulness (World Health Organization Incorporated, 2003). Advances in technology may bring healthcare professionals to closer to slaking economic

burden and placating adverse clinical outcomes with patients who practice poor medication adherence. Nevertheless, technological advances used to improve adherence are only asymptotic, but practical and economically necessary in battling the complexities behind the medication-taking behavior, bringing heathcare professionals ever so close to achieving optimal care for paitents.

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