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# Walden University

College of Social and Behavioral Sciences

This is to certify that the doctoral dissertation by

Cynthia Schmidt

has been found to be complete and satisfactory in all respects,  
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the review committee have been made.

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Walden University  
2018

Abstract

Physician-Patient Relationships and Their Effect on T2DM Patient Treatment Adherence

by

Cynthia Schmidt

MA, Amberton University, 2001

BS, Boston College, 1981

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Clinical Psychology

Walden University

August 2018

## Abstract

Type 2 diabetes (T2DM) is a health epidemic that continues to worsen. A major concern is that treatment adherence rates hover around 50%, despite the introduction of new medications, treatments, and technology. Lack of adherence by patients can lead to complications like blindness, kidney disease, and amputations. While there have been many studies conducted to evaluate patient factors related to adherence, fewer studies have been conducted to evaluate the role of the physician-patient relationship. The purpose of this study was to examine the correlation between the physician-patient relationship and patient treatment adherence, and examine the moderators of age, education, ethnicity, and income. Gender was included as a moderator in a secondary analysis. Two theories formed the theoretical framework of this study: biopsychosocial model and self-efficacy theory. This quantitative nonexperimental study was completed with survey data collected from 92 participants in the United States ages 18 or older who were under treatment for T2DM for at least a year, and who had seen their physician at least once in the previous year. Correlational and regression analyses were conducted using data from the modified Clinician and Group Survey and the Diabetes Management Self-Questionnaire. The physician-patient relationship predicted treatment adherence, and gender moderated the relationship. These findings suggest the importance of the physician-patient relationship as a factor in patient treatment adherence. This has important implications for social change because an understanding of which physician factors lead to treatment adherence may help improve patient outcomes, reduce T2DM complications, improve patient quality of life, and reduce healthcare costs.

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## Dedication

This dissertation is dedicated to my loving and supportive husband Fred and my precious children, Christofer and Lauren. They were there with me every step of the way. I still cherish the note of support that my daughter Lauren wrote to me after a particularly challenging week.

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## Chapter 1: Introduction to the Study

### **Introduction**

Diabetes is a costly and chronic disease. By 2010, diabetes was the seventh leading cause of death in the United States, and costs associated with diabetes were estimated to be \$245 billion in the United States alone (Centers for Disease Control and Prevention [CDC], 2014a, b). There are provider, patient, and healthcare system factors that affect diabetes treatment and adherence. The present study was on provider factors related to adherence to treatment recommendations.

Treating patients for Type 2 diabetes mellitus (T2DM) can include diet, exercise, medications, or a combination. However, patients are more likely to view medications as more effective than diet or exercise (Broadbent, Donkin, & Stroh, 2011). In spite of this, patients do not always adhere to their medications for diabetes. Evaluating just medication adherence, researchers have shown differences in patient medication adherence depending on the provider, but not what the reasons for those differences were (Sencan, Wertheimer, & Levine, 2011; Sherman, Sekili, Prakash, & Rausch, 2011).

Other studies have been conducted to evaluate communication between the physician and the patient as well as patient engagement. Better medication adherence was observed when patients were in alignment with their providers with regard to communication and they were engaged in managing their disease. Still, almost half of the patients diagnosed with diabetes are not adequately controlled, even though there are many medications to treat T2DM (Strain et al., 2014).

Complicating effective adherence to T2DM treatment recommendations are demographic and socioeconomic factors, which also were examined in this proposed study. For example, patients with lower income backgrounds are less likely to be adherent because of a lack of ability to pay for their medications (García-Pérez, Álvarez, Dilla, Gil-Guillén, & Orozco-Beltrán, 2013). Also, patients who live in neighborhoods that are not conducive to living a healthy lifestyle, such as ones where there is food insecurity or an environment without places to exercise, or where the patient does not feel safe walking around, can impede making healthy lifestyle choices (Powers et al., 2015). Education level can also impact treatment adherence. Patients with lower education levels or those who have low health literacy may not understand their disease, why they need to be adherent, and what the consequences are of not being adherent (Health and Human Services [HHS], 2008).

Age of the patient is also a factor in treatment adherence. For example, older patients may have physical limitations that impede their ability to exercise. They may also have difficulty following diet recommendations because they have eaten a certain way for a number of years. Finally, patients' ethnic background may affect their treatment adherence. It may be challenging for patients to change their diet if they are instructed to eat foods that are not familiar to them.

The researcher completed this study to examine whether there is a relationship between the physician-patient relationship and patient treatment adherence in adult patients diagnosed with T2DM. Four moderator variables were also included in the study. These were: age, education, ethnicity, and income. In this chapter, the



background, problem statement, purpose, and corresponding research questions are discussed. The theoretical framework of the study is also presented, with a more in-depth discussion in Chapter 2. Lastly, the significance of the study is presented, including how the results may contribute to social change.

### **Background**

Diabetes continues to increase both in the United States and worldwide. By 2030, it is estimated that 552 million people worldwide will have diabetes (Whiting, Guariguata, Weil, & Shaw, 2011). This is due in part to an increasingly obese and older population. Despite being encouraged to diet and exercise when diagnosed with diabetes, most patients do not adopt these recommendations (García-Pérez et al., 2013). Even with improvements in technology, medications, and methods to improve treatment adherence, adherence levels are still about 50% (García-Pérez et al., 2013).

There have been many studies investigating patient treatment adherence with regard to T2DM. These include studies on diet, exercise, and medication adherence. Overwhelmingly, good patient treatment adherence, whether diet, exercise, medication, or a combination leads to better patient outcomes in patients with T2DM. A nutritious diet is another key part of T2DM treatment, both to help lose weight and maintain a healthy weight. Approximately 80-90% of patients diagnosed with T2DM are overweight or obese (Vasilescu, 2015). Exercise can help reduce the chances of being diagnosed with T2DM and even reverse it in some patients. However, it is not always easy to find healthcare-based programs and insurance companies will not reimburse them for certain programs (Ades, 2015).

Sencan et al. (2011) and Sherman et al. (2011) conducted studies to evaluate patient medication adherence as instructed by the providers. There were differences found among providers regarding level of patient medication adherence, but the reasons for those differences were not determined. These results point to the possibility that physician differences including communication style and behaviors may contribute to the level of patient treatment adherence (Sherman et al., 2011).

There are several studies with general patient populations where researchers have evaluated the physician-patient relationship including communication, patient engagement with the physician (Simmons, Wolever, Bechard, & Snyderman, 2014), and shared decision-making (Peek, Drum, & Cooper, 2014). Better communication, engagement, and shared decision-making led to better patient adherence. The purpose of this study was to evaluate several of the physician-patient relationship aspects together, including communication, shared-decision making, trust, and respect to help identify if there are any aspects that correlate more with improved treatment adherence.

### **Problem Statement**

García-Pérez et al. (2013) indicated that only about 50% of patients are adherent. Additionally, the incidence of diabetes had almost doubled worldwide among adults, from 4.7% in 1980 to 8.5% in 2014, and is now considered a major health epidemic that continues to worsen despite adherence interventions (World Health Organization [WHO], 2016). Diabetes can lead to other serious complications including cardiovascular disease, stroke, kidney disease, blindness, neuropathy, and amputations. There are also concerns about its role in increasing cancer incidence in aging populations (WHO, 2016). Costs to

treat diabetes have tripled worldwide from 2003 to 2013. It is estimated that by 2030, diabetes costs, including direct and indirect costs, will total \$1.7 trillion worldwide (WHO, 2016). Direct costs are those associated with diabetes management, like medications or hospitalizations, while indirect costs can be associated with lost wages or inability to work due to disability (WHO, 2016).

Part of the successful management of diabetes includes diet, exercise, and if needed, medication. It also requires a patient to be engaged in their treatment (Simmons, et al., 2014). Patient engagement means that the patient understands and is actively engaged in helping to manage his or her health; and performs the behaviors to help reach this goal (Simmons et al., 2014). While there is a lot of research on patient-related factors and treatment adherence, patient treatment adherence has not improved. Diabetes incidence has continued to increase, along with complications and costs. There is, however, a lack of research on how the physician-patient relationship relates to patient treatment adherence.

### **Purpose of the Study**

The purpose of this quantitative study was to explore the gap in the literature regarding the physician-patient relationship and the connection that it may have to treatment adherence in patients diagnosed with T2DM. There are many studies where researchers have evaluated patient treatment adherence that focused on patient factors, but not health care provider factors or the relationship between the physician and patient that might relate to treatment adherence. Additionally, education, age, ethnicity, and income were studied as possible moderators of the provider-patient relationship and

treatment adherence. Sherman et al. (2011) found that medication adherence varied by physician, pointing to the effect of physician factors on adherence. This current study fills the gap in the literature by evaluating patient treatment adherence prospectively, by having patients' complete surveys on both treatment adherence and physician factors. This relationship along with potential moderators was evaluated to see if there was a relationship between level of satisfaction of the relationship with the healthcare provider and patients' treatment adherence.

### **Research Questions**

The following five research questions were addressed using the quantitative methodology to determine whether there is a relationship between healthcare provider-patient relationships and patient treatment adherence as measured by scores on the physician-patient satisfaction survey and DSMQ.

***RQ1:*** Among patients (ages 18+) with T2DM, is there a significant relationship between treatment adherence as measured by scores on the DSMQ, and the patients' scores on physician-patient satisfaction surveys for patients with T2DM?

*H<sub>01</sub>:* Among patients (ages 18+) with T2DM, there is no significant relationship between scores on the DSMQ and scores on physician-patient satisfaction surveys.

*H<sub>A1</sub>:* Among patients (ages 18+) with T2DM, there is a significant relationship between scores on the DSMQ and the patients' scores on physician-patient satisfaction surveys.

***RQ2:*** Does age moderate the relationship between patient satisfaction scores and treatment adherence?

*H<sub>02</sub>*: There is no moderating effect of age on the relationship between patient satisfaction and treatment adherence.

*H<sub>A2</sub>*: There is a moderating effect of age on the relationship between patient satisfaction and treatment adherence.

***RQ3***: Does level of education moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>03</sub>*: There is no moderating effect of level of education on the relationship between patient satisfaction and treatment adherence.

*H<sub>A3</sub>*: There is a moderating effect of level of education on the relationship between patient satisfaction and treatment adherence.

***RQ4***: Does ethnicity moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>04</sub>*: There is no moderating effect of ethnicity on the relationship between patient satisfaction and treatment adherence.

*H<sub>A4</sub>*: There is a moderating effect of ethnicity on the relationship between patient satisfaction and treatment adherence.

***RQ5***: Does income moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>05</sub>*: There is no moderating effect of income on the relationship between patient satisfaction and treatment adherence.

*H<sub>A5</sub>*: There is a moderating effect of income on the relationship between patient satisfaction and treatment adherence.

### **Theoretical Framework for the Study**

The theoretical framework of this study included both the biopsychosocial theory (BPS) and the theory of self-efficacy. The BPS theory, introduced by Engel in 1977, includes the psychosocial aspects of diseases that are not addressed with the medical model. These include the psychological and social aspects of functioning, which contribute to how an individual navigates living with a chronic disease (Sperry, 1988). Many healthcare providers are trained in treating patients using the biomedical model, and not the BPS model. Evaluating other factors that may impact treatment adherence like the healthcare provider-patient relationship or patients' socioeconomic status incorporates the psychosocial framework of the BPS theory.

Patient management of T2DM can be considered by applying the theory of self-efficacy. Self-efficacy, also known as personal efficacy, refers to the belief that an individual has about his or her ability to accomplish certain goals or tasks (Bandura, 1977; Lorig and Holman, 2003). Personal efficacy is influenced in four ways: individual accomplishments, watching others' experiences, verbal persuasion, and the individual's own physiological states (Bandura, 1977).

T2DM is considered a chronic disease and because it can be long lasting, requires that the patient to be an active participant in his or her disease management in order to reduce complications (Holman & Lorig, 2004). Self-efficacy for patients diagnosed and being treated for T2DM can include the following four factors. One is how the patients manage treatments prescribed by their providers, associated with verbal persuasion. Another is their level of personal success in managing their disease or level of

accomplishment. A third aspect is their physiological state. Lastly, watching others or experiential experience can be associated with belonging to support groups and seeing how others manage their chronic disease. Using both the BPS and the self-efficacy theoretical frameworks enabled both individual internal and biopsychosocial factors to be evaluated and was appropriate due to the variables in this study.

### **Nature of the Study**

This was a quantitative and correlational survey study design. This approach was selected to evaluate a potential relationship between the physician-patient relationship and patient treatment adherence. The predictor variables were scores on the Consumer Assessment of Healthcare Providers and Systems (CAHPS®) Clinician and Group Survey 2.0, English version (CAHPS) and the outcome variable was treatment adherence measured by scores on the Diabetes Self-Management Questionnaire (DSMQ). The hypothesis was that patients who score higher satisfaction and adherence scores on the surveys would also report better treatment adherence.

Multiple regression analyses were used to analyze the data. To test for interactions, moderation analyses were used to examine whether education, age, ethnicity, or income moderated the relationship between the “physician-patient relationship” predictor variable and the “treatment adherence” dependent variable. Demographic data on age, education, gender, income, and race were also collected through online surveys from Survata, SurveyMonkey, and paper and pencil surveys from two clinics that treat patients with diabetes.

## Definitions

*A1C*: The glycosylated hemoglobin test or A1C is a blood test that measures the average blood glucose level of a patient for the previous three months. A reading of 5.7% or below indicates normal A1C, while those from 5.8%-6.4% indicate prediabetes. Patients with an A1C of 6.5% or higher are diagnosed with having diabetes (National Institutes of Health, [NIH] 2014).

*Shared decision-making*: Shared decision-making is an approach where the patient and the healthcare provider work collaboratively to explore different treatment options and decide together what option to choose based on the values and preferences of the patient (Agency for Healthcare Research and Quality, 2016a).

*Treatment adherence*: Treatment adherence is described as how well a patient complies with the treatment regimen prescribed by his or her healthcare provider. This can include following diet, exercise, and medication regimens (García-Pérez et al., 2013).

*Type 2 Diabetes Mellitus (T2DM)*: T2DM is associated with insulin resistance where the pancreas is still producing insulin but the body is not utilizing it properly (Centers for Disease Control, 2014a, b).

## Assumptions

Several assumptions were made for this study. It was assumed that the respondents would answer the survey questions honestly regarding demographic information, treatment, and questions related to the participants' relationship and experience with their providers. It was also assumed that the participants would answer the questions on the survey about their treatment adherence honestly. Since treatment



adherence—as measured by DSMQ survey scores and the physician-patient relationship as measured by the (CAHPS)—are main variables in the study, it was important for the participants to answer accurately and honestly. Another assumption was that the physician has recommended the treatment behaviors to the patient. These include diet, exercise, and adherence to their medication. Finally, the CAHPS and DSMQ instruments used to collect the data were assumed to be valid and reliable.

### **Scope and Delimitations**

The participants selected for this study were men and women ages 18 and over, diagnosed with T2DM for at least a year. They must have also been under the care of a healthcare provider and have seen this provider at least once in the last 12 months. The patients needed to be receiving treatment for their T2DM. The treatment would consist of diet, exercise, or medications, prescribed individually or in combination.

The self-report surveys, written in English, were provided to the participants to complete online at SurveyMonkey or with paper and pencil for participants who did not have access to the internet. The data collected from the pencil and paper surveys were included with the online data collected from the SurveyMonkey surveys. Data was also collected from a clinic located in Louisiana. These clinic survey participants had the option to fill out paper and pencil surveys or fill the surveys out online. Paper and pencil surveys were offered to the clinic participants because most of their patients were on limited cell phone data plans. Paper and pencil surveys were also offered to participants from a clinic in Texas, along with the option to go online. Other survey participants were recruited from the Walden University's participant pool, Facebook, Texas Psychological

Association, Survata, and Nextdoor. These survey participants were directed to access a SurveyMonkey link provided by the researcher.

### **Limitations**

There are limitations that needed to be considered for this study, including threats to internal and external validity. One threat to internal validity was the correlational design of the study. Causality and direction of causality cannot be inferred from correlational studies and may be affected by other variables that may or may not be measured (Field, 2009).

Regarding external validity, one threat was that the participants may not have been representative of the general population. Only a small percentage of people participate in research, and in minority groups, the percentage of people that participate are even lower (Moyer, 2009). Also, according to the United States Census Bureau (USBC) (2015 a, b), approximately 16% of Americans, more likely those who are lower income, older, or minority are estimated to not have access to the Internet. This was an important group to access for the study because of the moderator variables and survey questions. Having the option of a paper and pencil survey also helped to address this issue.

Another threat to external validity was that study subjects who did not read or write English were unable to participate in the survey. Since the physician-patient relationship was the independent variable in the study and communication is a part of that relationship, this also excluded patients who do not read or write English and limited the diversity of the participant pool. Since the surveys were self-report surveys, there was no

way to know whether the participants were being honest and factual with their responses. Some participants may not have felt comfortable rating their provider, especially if the rating was a negative one. Finally, since the paper and pencil surveys were offered only to one clinic in Louisiana and one clinic in Texas these results cannot be generalized to other populations. However, using other sources like Facebook, Survata, the Walden University's participant pool, and Nextdoor drew from more diverse populations. The Texas Psychological Association (TPA) also posted an explanation of the study on their daily email update along with a link to SurveyMonkey.

### **Significance of the Study**

Current approaches to treating T2DM are not entirely successful, with only about half of patients adhering to treatment. Additionally, the incidence, comorbidities, and costs associated with T2DM continue to increase at a rapid pace, which is placing economic burdens on both individuals with T2DM and society as a whole. Diabetes is currently the seventh leading cause of death in the United States (CDC, 2014) and is expected to be the seventh leading cause of death in the world by 2030 (WHO, 2016).

Physician understanding of the patient through a biopsychosocial lens and patient engagement is now being recognized as important factors in management of T2DM. The American Diabetes Association (ADA) (2016, 2018) publishes recommendations for the treatment of diabetes each year. In 2015, the overriding theme was the individualization of treatment for patients with diabetes. The ADA recommendations also included shared-decision making between the patient and health care provider (HCP), and understanding of the patient's ethnicity, comorbid conditions,

likelihood of medication adherence, and patient preferences (Romeo & Abrahamson, 2015).

Patients with low socioeconomic status (SES) backgrounds and limited education have two to four times the risk of developing diabetes compared to individuals with higher income levels or more education (Torenholt et al., 2015). Poverty can lead to stress over finances, cost of treatment, and also lead to a lack of resources such as nutritious food or good housing (Hill, Nielsen, & Fox, 2013). If physician-patient relationship factors can be identified that improve patient treatment adherence, this may lead to better treatment adherence in patients with T2DM. Better T2DM management may lead to less diabetes complications, comorbidities, and direct and indirect costs associated with diabetes. Accordingly, there was a need for more studies to examine the healthcare provider-patient relationship.

Positive social change will occur if patients who are diagnosed with T2DM can learn about and are willing to more effectively manage their T2DM. This in turn should reduce healthcare costs by reducing T2DM complications and improving patients' quality of life. This might also help the physicians feel like they are helping their patients have better health outcomes. Having an increased understanding of these physician factors can lead to strategies that can be implemented to enhance patient treatment adherence.

### **Summary**

This chapter included a review of Type 2 diabetes mellitus (T2DM) and the challenges associated with treating it. T2DM is a worldwide problem that is continuing to grow. While many studies have been conducted to evaluate patient factors that affect

treatment adherence, there is a lack of studies evaluating the provider-patient relationship. Despite the medical advancements and increased information regarding the benefits of diet and exercise, compliance still hovers around 50%. Recommendations from the ADA include individualizing treatment for the patient by taking into account the cultural and socioeconomic background of the patient and also including the patient in shared decision-making about their treatment plan.

Also, in this chapter, the purpose of the study was discussed, along with the variables related to the physician-patient relationship and treatment adherence. The moderators of age, education, ethnicity, and income, as well as research questions were also included. The theoretical framework of the study, including the BPS model and the theory of self-efficacy, were discussed with the rationale behind using these theories as the theoretical framework.

The quantitative nature of the study and the participant qualifiers of age and type of diabetes were described. The rationale for collection of data through SurveyMonkey, Survata, and the Louisiana and Texas clinics was explained, along with how the data were analyzed using the Statistical Package for the Social Sciences (SPSS). Definitions were listed and assumptions, scope of the study, and limitations were also described. Finally, the significance of the study was discussed, including information on the societal need for a better understanding of what factors influence patient treatment adherence. Chapter 2 includes a review of the current literature on diabetes, the theoretical framework, treatment adherence and how it is measured, HCP factors associated with

T2DM disease management and potential moderators of age, education, ethnicity, and income.

## Chapter 2: Literature Review

### **Introduction**

This literature review includes an examination of the relationship between treatment adherence in patients with T2DM and potential physician factors that may affect the adherence. While researchers have examined patient and physician factors, there is little research on just the physician factors and the physician-patient relationship with regard to T2DM. Since T2DM is an increasing problem both in the United States and worldwide, and medication adherence varies, it is imperative to identify physician-related factors that may be contributing to patient variance in treatment adherence. Poor adherence leads to both increased healthcare costs and poor health outcomes.

This chapter provides an overview of the incidence of T2DM, treatment adherence and how it is measured, and physician-patient relationships. The theoretical frameworks of the BPS model and the theory of self-efficacy are also discussed. Also included is the data on medication adherence rates for patients with T2DM including improvements in technology to monitor or improve medication adherence in these patients. The increase of medications available to these patients has not improved medication adherence either (Strain et al, 2014). Interventions to improve medication adherence may be a more effective approach to improve population health outcomes than the treatments themselves (Sabaté & WHO, 2003). This current research adds to the existing literature by addressing the gap in identifying those provider (physician) factors that relate to treatment adherence in patients diagnosed with T2DM.

### **Literature Search**

A literature review was conducted by using the Walden University databases Academic Search Complete, ProQuest Central, and Science Direct. Also, PsycINFO was searched alone and in combination with all databases selected to ensure the health and business databases available on EBSCO were included. Searches were also conducted using Google Scholar. Key words used included: *Age, biopsychosocial theory, diabetes mellitus, diet, education, ethnicity, exercise, income, medication adherence, physician-patient relationships, treatment adherence, and Type 2 diabetes*. Peer-reviewed journal articles and books were included with an emphasis on current research. Current articles published within the last five years were included in this study, as well as older articles that were foundational for the current research.

### **Biopsychosocial Model and Theory of Self-Efficacy**

The biopsychosocial (BPS) model was chosen as part of the theoretical framework to examine how treatment adherence is affected by various factors, including those that are patient, physician, and health care system focused. Despite all the advances made with diabetes treatment, there is still less than ideal control among individuals with T2DM. This has led to a focus on the psychosocial factors of diabetes instead of just the medical aspects (Holt & Kalra, 2013).

The BPS model was first proposed by Engel (1977) as a response to the medical model of disease that did not include the psychosocial factors that also have an impact on disease. The BPS model is much like von Bertalanffy's general systems theory where all levels of an organization are thought to affect each of the other levels, whether it is



biological, personal, or social (Ravenek et al., 2013; Williams et al., 2000). The BPS model is comprehensive and integrative, making it well suited for chronic conditions (Sperry, 1988). The biological aspects of the model include physical and biological functioning of the patient, which also encompasses autonomous body functioning outside of conscious awareness. The psychological aspects of the model are how individuals view themselves, the outside world, cognitions, behaviors, and motivations. The social part of the model encompasses the individual's behaviors related to family, friends, culture, and institutions (Sperry, 1988). The BPS model can be used as a framework when evaluating the different factors that affect treatment adherence, including the healthcare provider relationship with the patient. Many healthcare providers have been trained on the biomedical model but not the BPS model. This leaves a gap in their ability to address the psychosocial aspects of T2DM (Jaini & Lee, 2015). The biomedical model is based on only the biological factors affecting health and excludes the psychological, social, or behavioral aspects that may affect how the patient manages his or her health (Engel, 1977).

Treatment adherence does not take place in a vacuum. Patients are challenged by other factors that make adhering to their treatment plan for chronic diseases much more difficult and add to their burden of treatment (BOT). In a multi-country web-based qualitative study of patients with chronic conditions, several BPS factors were found that contributed to BOT—managing the medications at home and away, cost of medications, financial burden of the T2DM on the patient, social and professional consequences, access to healthcare, coordination of healthcare, and management of chronic diseases

(Tran, Barnes, Montori, Falissard, & Ravaud, 2015). Patients with diabetes are required to make daily self-care decisions, some of which can be complex (Powers et al., 2015).

Part of the coordination of treatment for T2DM may also involve diet and exercise with or without medication. In some patients who are obese, just dieting alone can help them get to a normal weight and stop them from being diabetic. Exercising also helps patients lose or maintain their weight, as well as better control their diabetes (Nazarko, 2010). The BPS model framework is helpful for identifying how biological, psychological, and social factors can affect the ability of a patient to follow diet and exercise guidelines when diagnosed with T2DM (Snooks, 2009).

The biological aspects of diet include: health, hunger or appetite, satiety, energy, genetics, and nutritional needs. The psychosocial aspects include: appetite, emotions, cultural and family background, learned behaviors, media influences, and socioeconomic factors (Snooks, 2009). For example, it may be difficult for patients to find healthy foods to eat if they are located in a food desert where access to stores with healthy foods is limited (Bader, Purciel, Yousefzadeh, & Neckerman, 2010). Having limited or low-quality foods available would make it difficult for the patient to follow a healthy diet. Exercise may be influenced by biopsychosocial factors too. Socioeconomic status (SES) can affect level of exercise in different ethnic groups along with nutritional and psychosocial factors (Wang & Chen, 2011). One reason for less physical activity is that residents with low SES may live in neighborhoods where safety is a concern. Also, these individuals may suffer from depression or have other barriers to exercise such as health

issues, time constraints, and lack of energy (Meyer, Castro-Schilo, & Aguilar-Gaxiola, 2014).

The patient's capacity to juggle all of these factors can become a challenge as more of the demands of life are placed on the patient. This can lead to an imbalance in workload and capacity where the patient is unable to manage his or her illness effectively, leading to more negative health outcomes (Shippee, Shah, May, Mair, & Montori, 2012). Patients diagnosed with T2DM can spend two hours or more each day managing their self-care, which can add to the BOT (Tran et al., 2012). Patients living with T2DM can experience reduced quality of life and increased emotional distress because of fluctuations in blood glucose levels and loss of freedom in decision-making. For example, a patient diagnosed with diabetes may have to make different food choices (Kadirvelu, Sadasivan, & Ng, 2012).

Additionally, the burden of managing their disease becomes more of a patient and caregiver responsibility than that of the healthcare system. The patient may be tasked with monitoring and managing his or her treatment at home. If the patient has low health literacy, cognitive impairment, or physical limitations, this can present challenges to the patient managing their disease (Mair & May, 2014). The burden of treatment is not routinely addressed in patient-clinician clinical encounters. According to Bohlen, Scoville, Shippee, May, and Montori (2012), discussions of BOT usually does not include any strategies to help solve it. Tran et al. (2012) constructed a treatment burden questionnaire (TBQ) that they validated using a sample of 502 patients in France, and

concluded that this questionnaire could be used to determine treatment strategies to improve healthcare outcomes in patients with chronic diseases.

### **Theory of Self-Efficacy**

The biopsychosocial model helps to explain how different factors affect health, but it does not explain how the patient can learn to control or self-manage his or her chronic disease. Self-management of disease involves three aspects. The first is to treat the medical aspects of the chronic disease like taking medications. The second aspect is that of finding ways to live a meaningful life by adjusting one's behaviors to incorporate elements of the chronic disease. The third aspect involves the emotional components of adjusting to the chronic disease. For example, a patient with foot neuropathy from diabetes may benefit from exercising in a chair (Corbin & Strauss, 1988).

One program that has demonstrated success is the Stanford University Chronic Disease Self-Management Program (CDSMP). In addition to improving symptoms of chronic diseases like fatigue and depression, this program has helped patients to foster better communication with their physicians (Ory et al., 2013). This program was based on a study of a trial evaluating a community-based self-management program for patients with chronic illness (Stanford Patient Education Research Center, 2016). Learning from patients that a sense of control helped in managing their chronic illness led Lorig to the theory of self-efficacy (Lorig & Holman, 2003). This is based on Bandura's (1977) theoretical framework of self-efficacy where personal efficacy comes from four sources, the individual's own successful accomplishments, being verbally persuaded, his or her physiological state, and vicarious experiential experiences.

Taking part in these chronic disease self-management programs helps patients with the medical, emotional and lifestyle areas. Lorig discussed how in addition to the medical knowledge that patients are given, having other patients share how they have lived with chronic disease or patient knowledge helps these individuals with chronic illness model these behaviors, which helps to increase self-efficacy (cited by White, 2005).

In summary, effective diabetes management does not happen in a vacuum, resting solely on the patient and medical management. There are other psychosocial factors that can help or hinder diabetes management. These factors include: the patient's cultural beliefs, religious beliefs, friends and family, health literacy, beliefs about T2DM, peer support, and gender. Incorporating these other psychosocial aspects to personalize the treatment plan for the patient may improve diabetes self-management, (Kadirvelu et al., 2012).

### **Type 2 Diabetes Mellitus**

There are two types of diabetes. Type 1 diabetes occurs when the beta cells in the pancreas are unable to produce insulin. Insulin is needed to reduce blood glucose levels in the body. As a result, individuals diagnosed with Type 1 diabetes are insulin dependent and must either inject insulin or use an insulin pump. Type 1 diabetes in adults makes up only 5% of diabetes cases. Type 2 diabetes mellitus (T2DM) is associated with insulin resistance where insulin is still being produced by the beta cells but is not being properly utilized by the body. According to the Centers for Disease Control (2014a, b), T2DM accounts for 90-95% of diabetes cases in adults.

Diabetes is also a growing health concern worldwide. The World Health Organization (2016), in its global report on diabetes, estimated that the worldwide prevalence of diabetes was 8.5% in adults. In the United States, the overall percentage of adults with diabetes has steadily increased over time and was estimated to be 12-14% in the overall population in 2011-2012. This increase compared to 1988-1994 was seen across all age groups, income levels, education levels and races, although not uniformly. Increased incidence of diabetes may be attributed to the increase in obesity and an aging population (Menke, Casagrande, Geiss, & Cowie, 2015). The World Health Organization (2016) estimated that by 2030 diabetes would be the seventh leading cause of death. In the United States, by 2010, diabetes was already the seventh leading cause of death (CDC, 2014b).

Furthermore, T2DM can be harder to diagnose and it can lead to other health problems like kidney and cardiovascular disease, diabetic retinopathy, neuropathy, and limb amputations (WHO, 2016). Patients with diabetes have double the risk of dying, when compared to patients without diabetes. One percent of the world's blindness is attributed to diabetic retinopathy and diabetes is considered one of the most common causes of kidney failure (WHO, 2016).

Although patients with diabetes have a higher risk of dying than those without diabetes, this is not uniform across all age groups. Tancredi et al. (2015) conducted a study to evaluate the risk of death from cardiovascular disease and other causes in patients with T2DM compared to a control group. They found that there was an increased risk of death in patients who were younger, had renal disease, and higher A1C

levels. However, older patients, 75-years-of-age or more, with A1C of 7.8% or less were less likely to die than those in the control group while patients younger than 55 had twice the risk of dying than those in the control group. This is concerning because the incidence of T2DM continues to increase in younger adults and adolescents. When diagnosed with T2DM at an earlier age, these individuals are at risk to develop more adverse cardiovascular and renal complications, as well as neuropathy, retinopathy, and fatty liver disease (Wilmot & Idris, 2014).

T2DM can be considered a chronic disease. Unlike acute disease which usually can be treated and does not last for long, chronic disease tends to be long-lasting and the patient has to take a more active role in the management of his or her disease to reduce the chances of the disease worsening over time (Holman & Lorig, 2004). Since T2DM is the most common type of diabetes, it will be the focus of this review.

### **Treatment Adherence**

Treatment for patients with T2DM can include behavioral lifestyle changes incorporating diet and exercise as well as medication adherence. When managing patients with T2DM, it is important to individualize the treatment plan for the patient. While the goal of therapy is to achieve an A1C of  $\leq 6.5\%$ , for some patients a higher A1C level may be acceptable based on other comorbidities, length of time from T2DM diagnosis, history of hypoglycemia, or advanced age (Garber et al., 2016).

The A1C test is used for diabetes diagnosis, management, and research. This test provides a three-month snapshot of the patient's average glucose levels. The A1C test gives a three-month average because it is based on glucose and its attachment to

hemoglobin, which is found in red blood cells. These cells live about three months on average. The higher the test result, and the higher the glucose level over the previous three months. Normal A1C levels are 5.7% or below. Levels from 5.8% –6.4% indicate that the patient is prediabetic, and those 6.5% or higher mean the patient has diabetes (NIH, 2014). The healthcare provider can play an important role in educating the patient about their disease, treatment recommendations, and the patient's own role in managing his or her disease (Philips & Phillips, 2016). Psychosocial factors like financial resources, safety of living environment, and food security can also affect how patients are able to manage their disease and treatment plan (Powers et al., 2015).

### **Diet**

One lifestyle behavior, diet, can strongly influence T2DM. Maintaining a healthy, plant-based diet that includes healthy fats to maintain or reduce body weight can lead to positive T2DM outcomes (Garber et al., 2016). A balanced diet can help maintain normal blood glucose levels and help decrease insulin resistance. When blood glucose continues to be elevated, like with T2DM, this can lead to other health issues such as cardiovascular and kidney disease. Patients' belief about the effectiveness of a healthy diet can also affect their behavior. Broadbent, Donkin, and Stroh (2011) conducted a study of 157 patients with diabetes, 108 with T2DM, to evaluate their perceptions of illness and treatment in diabetes. The patients ranked medication adherence as more important than diet and exercise for diabetes management.

One way the physician can improve dietary choices and outcomes is to add a registered dietician to the patient's healthcare team (Malaguti-Boyle, 2016). Diet or



medical nutrition therapy (MNT) is important because of the high rate, 80-90%, of patients with T2DM who are overweight or obese. Even a weight loss of five to ten percent of body weight can lead to better health outcomes (Vasilescu, 2015).

The type of diet chosen also needs to be considered. Interestingly, the diet recommended by the ADA has been found to be less effective in reducing A1C than the Low-Carbohydrate Mediterranean Diet (Pizzorno, 2014). This is because calories from food intake are not all created equal. Food can change the metabolic state of the body in positive (nutrient rich), or negative (high glycemic index foods) way. More focus should be placed on eating nutrient rich foods and less on nutrient poor foods (Pizzorno, 2014).

### **Exercise**

Next to diet, physical exercise that includes both cardiovascular and strength training is another important part of T2DM management. This includes patients who are trying to lose weight and patients who are trying to maintain their weight (Garber et. al., 2016). Data from studies indicate that T2DM can be prevented or reversed with exercise. However, the infrastructure to support lifestyle management of diabetes like exercise is not readily available through health care systems like cardiac rehabilitation programs are. Also, insurance companies do not provide reimbursement for lifestyle management. This leads to increased reliance by the physician on the use of medications to treat T2DM even though lifestyle changes like diet and exercise can reduce or eliminate the need for medications (Ades, 2015). However, more reliance on medication by the physician might be due to the patients' perception that medication is more important than exercise, just as with diet (Broadbent, Donkin, and Stroh, 2011).

Exercise has been found to improve glucose control even if the patient does not lose weight. It has also been shown to improve cardiovascular risk factors like hypertension (Ross & Janiszewski, 2008). Exercise guidelines for individuals with diabetes have been recommended by both the ADA (2018) and the American College of Preventive Medicine (2011). These guidelines include both aerobic and strength training exercises (Hameed, Shereef, & Hussain, 2011). Current recommendations from the American Association of Clinical Endocrinologists and the American College of Endocrinology are at least 150 minutes per week of moderate exercise, for example walking at 15-20 minutes per mile, along with strength training. Modifications should be considered for patients with diabetes along with other complications like co-morbidities or obesity (Garber et al., 2016).

### **Medication Adherence**

Medication adherence can be defined as the extent to which a patient follows his or her physician's recommendations for a medication that he or she has been prescribed. Interpreting medication adherence rates can be a challenge because there are several different ways of measuring adherence. There are patient self-reports, and quantitative measures like pill bottle monitors or electronic medical record refills, none of which has been identified as the gold standard for measuring patients' medication adherence (Blackburn, Swidrovich, & Lemstra, 2013).

García-Pérez and colleagues (2013) discussed the differences between the definitions of adherence, compliance, and persistence. Adherence refers to a measure of how good the patient is at following healthcare provider recommendations and taking his

or her prescribed medicines. This can be assessed directly with electronic health records or indirectly by asking the patient. Compliance is often used interchangeably for adherence but does not require that the patient agree to the provider's recommendations. Compliance is a measure of the proportion of doses that were administered to the patient over the proportion of doses prescribed, over a certain length of time (García-Pérez et al., 2013). Persistence refers to how long the patient continues to take the medication during the prescribed length of time. Patients given medication that requires one dose per day show better adherence than more than once a day (Donnan, MacDonald, & Morris, 2002).

There are also different types of medication non-adherence. There is primary non-adherence where the patient never has the prescription filled, non-persistence where the patient starts to take the medication, but then stops taking it and non-compliance (poor execution) where the patient takes the medication, but does so improperly (Blackburn, Swidrovich, & Lemstra, 2013). Patients may make the decision to not take their medications known as intentional non-adherence, or they may exhibit passive or unintentional non-adherence where they forget or are careless about medication adherence. Some patients may be associated with both, although even with unintentional non-adherence there may be underlying perceptions about adherence based on patients' medication beliefs, social factors and chronic disease that drive this non-adherence, making it not so unintentional after all (Gadkari, & McHorney, 2012).

Over the last several years, there have been advancements made in the treatment and management of T2DM including new medications, improved technology, and ways

to track medication adherence. Despite these advances, around half of diabetes patients are still not meeting treatment goals. In the ENTRED study (Tiv et al., 2012), a French population-based study of 3,367 individuals with T2DM, researchers found that 39% of the patients had good adherence, 49% had medium adherence, and 12% had poor adherence. This was despite the fact that these patients had access to good healthcare.

In a study conducted in a large integrated healthcare system where the patients had a pharmacy benefit, which included patients with diabetes, adherence was higher in White, male, older patients with higher SES, but lower in ethnic minorities, those with lower SES, and those with less education (Rolnick, Pawloski, Hedblom, Asche, & Bruzek, 2013). Other studies have shown similar results. Evaluating medication and Medicaid adherence among recipients with chronic diseases, Khanna, Mahabaleshwarkar, Basak, Datar, and Banahan (2012), found similar outcomes with White males being more adherent than female and Black patients enrolled in a state Medicaid program. Differences in medication adherence according to gender have been investigated in other studies (Manteuffel et al., 2014). Unintentional non-adherence by patients also shows similar patterns with regard to those who are White, with higher incomes, and more education less likely to be non-adherent to medications (Gadkari & McHorney, 2012). Strategies to improve medication adherence in T2DM patients have not proven to be effective, whether singular approaches are used such as text message reminders, or more comprehensive multifaceted approaches (Blackburn et al., 2013).

While the main focus of this dissertation is on medication adherence, patients who are initially diagnosed with T2DM are not always prescribed medications at diagnosis.

Instead they may be told to exercise, diet or do a combination of both diet and exercise to see if that improves their A1C levels before starting on any medication (García-Pérez et al., 2013). Additionally, they may be asked to incorporate both medication and lifestyle changes into their treatment regimen. Therefore, lifestyle changes will be included within the outcome treatment adherence.

In summary, even though there have been several different strategies developed, to increase medication adherence, 50% of patients with T2DM are still non-adherent. This is heightened by the increase in diagnosis of T2DM worldwide. There is also no gold standard for measuring medication adherence. Some patients, when first diagnosed with T2DM, may be asked to make lifestyle changes alone or in combination with a medication treatment plan.

### **Physician Factors Related to Treatment Adherence**

There are several different factors that affect patients' adherence to healthcare providers' prescribed treatment plans. These include patient related, health system and provider factors, and social factors (American College of Preventative Medicine [ACPM], 2011). Considerable research has been conducted on patient-related factors, but there is limited research on how healthcare provider-patient relationships affect patient medication adherence.

In the past, patients placed trust in the relationships with their physicians, but over time this has changed as healthcare has turned into a commodity, with many different individuals directing physician decision making for their patients and reducing the time that patients can spend with their physicians (Osorio, 2011). Compounding the

physicians' limited time with patients, there is a lack of understanding of what healthcare delivery strategies are beneficial for improving medication adherence, which is a serious gap in the knowledge base that needs to be addressed (Sherman et al., 2011)

One aspect of the physician-patient relationship, poor communication, has been cited as a factor in non-adherence (Vermeire, Hearnshaw, Van Royen, Denekens, 2001). Another physician factor involves patient engagement. According to a systematic review of patient engagement studies by Simmons et al. (2014), more engaged patients, including those with diabetes, had better health outcomes. In one qualitative study of nine patients, Cotugno and colleagues (2015) found that the patients valued a good relationship with their practitioners. This is one where the HCP was empathetic and provided education on their disease, meeting the patient at the level they were at in terms of understanding what the patients' educational needs were

Patients that are actively involved in the process of making health care decisions with their physicians have better medication adherence (Parchman, Zeber, & Palmer, 2010). However, this can vary based on the health beliefs and attitudes of both the physician and patient. Improved medication adherence is seen when these two are aligned (Christensen et al., 2010). Good communication and a shared decision-making approach with the physician can lead to improved medication adherence. Therefore, a lack of these elements may lead to misunderstandings about the disease or a decision not to fully disclose concerns by the patient, leading to medication non-adherence (Guénette et al., 2015; Längst et al., 2015).

Miscommunication between the patient and the physician can be a reason for medication non-adherence. In a study conducted by Lapane, Dube, Schneider, and Quilliam (2007), the authors found that providers gave only basic instructions on medications while patients wanted to know more in-depth information about medications, like side effects, duration of use, benefits of medication, and efficacy. This led to decreased medication adherence because of a lack of patient understanding of the need to take his or her medication correctly. Furthermore, according to Lapane and colleagues, while a large percentage of physicians believed that their patients were adherent, many patients were reluctant to tell their physician that they did not want to take or did not plan on purchasing the medication.

Clinical inertia, defined as the physician's lack of initiating or escalating treatment when the patient's A1C is not at an optimal level (Ziemer, et. al, 2005) is another physician factor contributing to poor diabetes management. Bailey and Kodack (2011) conducted a review on T2DM and patients' medication adherence. The researchers found that even if physicians were aware of the guidelines on optimal A1C levels, the physicians still did not escalate the patient's treatment plan if they were not at optimal levels. Another study by Strain et al. (2014) evaluated clinical inertia from both the patient and physician perspective. Their findings indicated the physicians had low expectations of their patients while the patients did not have a good grasp on the importance of managing their diabetes. Despite the increase in medications to treat T2DM, nearly half of the patients with diabetes are not adequately controlled.

Patients find more value in learning more about their disease or medications than receiving medication reminders like texts (Cascade, Bharmal, Rosen, & Plummer, 2010). More support for the importance of good communications between the HCP and the patient came from the results of a study conducted by Bunting, Lee, Knowles, Lee, and Allen (2011) using a chronic care management model for diabetes that incorporated patient education. These researchers found that using this model helped reduced cost per patient and increased patients' target A1C levels from 38% to 53%.

The quality of physician-patient communications was evaluated in the Diabetes Study of Northern California (DISTANCE) to evaluate any associations between medication adherence and patient communication ratings with their healthcare providers (Ratanawongsa et al., 2013). This study included 9,377 patients diagnosed with hypertension, diabetes, hypercholesterolemia or a combination of these diagnoses. These researchers found that patients who reported lower communication scores had lower medication adherence, especially those diagnosed with diabetes. The opposite was also seen, where higher provider scores correlated to better medication adherence.

In summary, there are several ways in which physicians may have an impact on patient adherence. Is the physician engaging the patient in his or her treatment plan? Is the physician explaining why the patient has to be on medication and why it is important? Does the physician understand the other biopsychosocial issues that the patient faces when dealing with his or her diagnosis and treatment? Does the patient trust the physician enough both to explain how he or she feels about taking their medication or not taking their medication and to believe that he or she needs the medication? Finally, does



the physician have clinical inertia where the patient is not having their medications adjusted despite not being controlled adequately?

### **Moderators of Treatment Adherence**

In addition to physician factors that may affect treatment adherence in patients, other factors like age, ethnicity, income, and education levels may moderate the association between treatment adherence and the physician-patient relationship. These moderating factors are often included in research (MacKinnon, 2011). Hayes (2013) defined moderators as those variables that can have an effect on or moderate the relationship between two other variables.

Moderators can weaken or strengthen, the relationship between the IV and the DV (von Eye & Mun, 2013). Moderators can also help to identify which individuals may have different results (Kraemer, Wilson, Fairburn, & Agras, 2002). Moderators can assist in stratifying responders from non-responders, thereby helping to tailor interventions. Moderators that are associated with the individual, such as age and income can help the researcher understand which groups may respond differently, while moderators that are associated with treatments would show under which conditions intervention effects would be seen (Chmura Kraemer, Kiernan, Essex, & Kupfer, 2008). For example, the level of income may potentially weaken the relationship between medication adherence and the physician-patient relationship if the patient has lower income and cannot afford medications but has a good relationship with the physician. Income level can affect the physician-patient relationship in other ways. As the income level decreases, physicians may treat these patients differently by not offering them the

same health information or treatments that they would to those with higher income levels. Also they may not listen or show as much emotion with these lower-income patients (Verlinde, De Laender, De Maesschalck, Deveugele, & Willems, 2012). In turn, these patients may have less trust for the physician, seek healthcare less often, and present with more serious illness when they do seek healthcare (Mascarenhas, et al., 2006).

### **Moderators**

#### **Age**

**Age and treatment adherence.** Age is a non-modifiable risk factor and is included in studies as a sociodemographic factor. Challenges with treatment adherence, whether diet, exercise or medication adherence, when managing T2DM can vary by age. There are factors that can be unique to each age group. Patients who are ages 65 or older, who represent 27% of diabetes cases, have eaten a certain way for a number of years and it may be challenging for them to follow a more restrictive diet (Hemphill, Stephens, Rook, Franks, & Salem, 2013). According to Phillips and Phillips (2014), approximately one-third of this age group do not have teeth, which can also make it difficult to follow a healthy diet.

Younger adults with T2DM are often managed using diet alone. This can be problematic since a diagnosis of T2DM at a younger age can lead to high-risk complications (Benhalima et al., 2011a). Benhalima and colleagues (2011) also reported that some of the issues with this age population include: non-adherence, risk-taking behaviors, and lack of long-term planning. In their observational study of 185 young adults, patients age  $24 \pm 5.5$  years at presentation were followed for five years. sixty-

three percent of the participants had A1C levels that were still  $>7\%$  even after treatment Benhalima et al. (2011b). Twelve percent of the participants, at presentation, were started on a diet alone. Hernández-Alvarez et al. (2010) reported that in some obese patients diagnosed at a younger age (18-25 years-of-age), diet may not be as effective due to abnormal mitochondrial proteins and genes that do not function normally leading to insulin resistance. This means that some patients diagnosed at a younger age might not lose weight even if they are on a proper diet plan.

Reasons for exercising can also vary according to age. Both older and younger individuals may exercise for social reasons. However, older individuals may exercise to delay health issues associated with aging while younger individuals may exercise for weight management (Allender, Cowburn, & Foster, 2006). According to 2008-2010 data from the Centers for Disease Control (2016), overall, approximately one-third of adults do not exercise. Included in the CDC's data were exercise statistics. Only 20.8% of adults participated in both strength training and aerobic exercise while aerobic physical activity decreased with increasing age. Phillips and Phillips (2014) found that patients who are older may find it difficult to exercise due to mobility issues, cognitive decline, or risk of falling.

Even when patients are diagnosed with diabetes, they do not always make the decision to exercise although this can vary by age too. In a study conducted by Morrato, Hill, Wyatt, Ghushchyan, and Sullivan (2007), in patients diagnosed with diabetes  $<40\%$  engaged in moderate exercise or more intense exercise. Younger adults were more likely to exercise than older adults. This may be a function of the physical limitations seen in

some patients with increasing age. However, just as with diet, a portion of younger adults with T2DM may have abnormally functioning mitochondrial proteins and genes, in this case reducing their response to exercise (Hernández-Alvarez et al., 2010). Again, this same patient population may be exercising but not gaining the health benefits to improve their diabetes. The other issue with exercise is the generic recommendations made by many physicians to exercise, that are not tailored to the patient and do not address the problematic metabolic effects caused by T2DM (O'Hagan, De Vito, & Boreham, 2013).

Across several studies, older patients tended to be more adherent to their medications than those who are younger (Briesacher, Andrade, Fouayzi, & Chan, 2008; Feldman et al., 2014; Tiv et al., 2012). Younger patients were also shown to have higher A1C levels than older patients in a study conducted by Daly et al. (2009). This may result from poorer compliance observed in younger patients versus older patients with diabetes.

The results of the National Health and Nutrition Examination Surveys (NHANES) reported by the CDC were that patients diagnosed with diabetes ages 18-39 years had poorer glycemic control than those patients who were 40-64 years and even poorer control than patients  $\geq 65$  years (Frieden, 2012). However, as discussed previously, some of these younger patients may have abnormally functioning mitochondrial proteins and genes that prevent them from experiencing the benefits of diet and or exercise, even if they are being adherent to their medication. This may make it harder for them to gain better control of their A1C.

In summary, even though diet, exercise, and medications, alone or in combination are recommended for treatment of T2DM, there are often challenges to adherence, based on the age of the patient. Older patients may have physical limitations or deeply ingrained eating habits, while younger patients may have poor adherence to their medications or engage in risky lifestyle behaviors.

**Age and physician-patient relationship.** There is limited information on how age affects the physician-patient relationship. In a study conducted by Peck (2011), the author discussed that physicians were more likely to have patient-centered encounters with their older than age 65 patients, which led to increased patient satisfaction. Patient-centered encounters are ones where the patient works in collaboration, takes an active role, and mutually agrees with their physician on healthcare decisions (Asimakopoulou, & Scambler, 2013).

Older patients may take a more deferential role with their physicians than those who are younger, or they may be used to a physician encounter where the physician is viewed as the authority. However deferential behavior on the part of the patient cannot always be equated with a positive physician-patient relationship. One aspect of the physician-patient relationship, effective communication, does appear to diminish when patients are older. In a study by Smith (2013), it was found that older patients >65 were more likely to be dissatisfied with how the physician communicated with them, especially if there were other factors involved like lower income, being uninsured, having a lower education level, or if the physician was not the patient's usual healthcare provider.

One reason why these results might have differed is because Peck (2011) collected data from only one multi-physician practice of which two of the physicians practiced geriatric medicine. Smith (2013) used data gathered from the Medical Expenditure Panel Survey (MEPS), which is a U.S. national survey consisting of data collected from a subset of communities. What is important to note is the aging of America. The U.S. Census Bureau (2015b) reported that by 2060, it is estimated that there will be 98.2 million people aged 65 and older and would comprise 25% of the population whereas in 2013, people aged 65 and older, made up just 14.1% of the population.

### **Education Level**

**Education level and treatment adherence.** Treatment adherence can be dependent on the education level of the patient. For example, education level can affect dietary choices. Lack of knowledge about nutrition can make it difficult to understand how or why it is important to make healthy food choices. Overall, higher education level and income is associated with better quality diets (Darmon & Drewnowski, 2008). It can be difficult to separate out how much influence education level has on treatment adherence versus income level.

However, in a study assessing diet patterns in 17,062 Black and White participants evaluating different factors, including education, Kell, Judd, Pearson, Shikany, and Fernández (2015) found that individuals with higher education levels were more likely to make healthier dietary choices. They also found that education level was a

stronger predictor than income level. Adults with higher education levels were more likely to exercise. (Morrato et al., 2007).

One way that education level can affect medication adherence is if patients have low health literacy. It is estimated that about one-third of the overall U. S. adult population has basic or lower health literacy. However, in certain groups this number can be even higher (Weiss, 2015). Health literacy is important because it affects how individuals understand their disease, take medications, process information, and can follow instructions (HHS, 2008). Patients with low health literacy may also mistakenly believe that they are controlling their diabetes and therefore choose not to make changes to better control it (Ferguson et al., 2015).

Lower education levels can lead to medication non-adherence due to low health literacy. Koprulu, Bader, Hassan, Abduelkarem, and, Mahmood (2014) conducted a study of T2DM patients' adherence to diabetic treatment that included demographic factors. The authors found that patients with limited or no education were more likely to be non-adherent to their diabetes medications. One reason for this is that there are a higher percentage of individuals with lower health literacy in those groups with less education, especially among individuals who did not graduate from high school. (HHS, 2008). Individuals with a secondary education are more than two times more adherent to their diabetes medications than those without one (Bakar, Fahrni, & Khan, 2016; Cho & Kim, 2014), and this supports other studies with similar results that higher education levels lead to better adherence. In summary, education level can affect treatment

adherence. Patients with less education may not understand how to make healthy diet choices, may be less likely exercise, and less likely to be adherent to their medications.

**Education level and physician-patient relationship.** Education level can impact the type of communication and relationship that patients share with his or her physician. For example, Verlinde et al. (2012) discussed how patients with lower levels of education may not feel comfortable asking the physician questions or the physician may interact with them differently, not allowing them the opportunity to ask questions. However, patients who have higher levels of education may feel more comfortable asking their physician questions.

### **Ethnicity**

**Ethnicity and treatment adherence.** Following a healthy diet can be one of the biggest challenges that a patient with T2DM faces when trying to manage their disease and treatment plan. They can feel like they are being deprived or restricted from eating what they are used to eating (Cheng et al., 2016). This can be further complicated by the ethnic backgrounds of the patients.

Different groups have certain food preferences, cooking techniques, or beliefs about food that may not reflect what has been recommended to them. Furthermore, patients from different cultural backgrounds may not understand what foods constitute healthy food choices (Carr, 2012). There is also a lack of published studies investigating ethnic minorities and weight loss interventions even though they are at higher risk for obesity and health issues. Those that have been published were short-term, small sample size, or lacked follow-up (Osei-Assibey, Kyrou, Adi, Kumar, & Matyka, 2010).



Even if there is awareness about healthy food choices, food insecurity or cost can make it difficult for the individual to purchase healthier foods. Strings, Ranchod, Laraia, and Nuru-Jeter (2016) investigated race and sex differences in the association between food insecurity and Type 2 diabetes. In their study, race was found to moderate the relationship between food insecurity and T2DM, in White men and women, and Hispanic women, but not African American men and women or Hispanic males. (Strings et al., 2016).

Overall, diabetes self-care varies and one of the components of self-care is physical exercise. Johnson, Ghildayal, Rockwood, and Everson-Rose (2014) reported that diabetes self-care varied from 20% of patients with high levels of self-care to 64% with moderate and 16% with low self-care. Physical activity was one of five self-care behaviors assessed in their study of diabetes self-care activities by race/ethnicity and insulin use. The highest group with a sufficient amount of physical activity was American Pacific Islanders, while the group with the lowest was the Hispanic group. The overall physical activity for all ethnic groups was 63.2%.

Adherence to medication and T2DM patients stratified by ethnicity is not a well-researched subject (Peeters et al., 2011). In a study of T2DM veterans by Gebregziabher et al. (2011), they found that non-Hispanic Blacks had lower medication possession rates than non-Hispanic Whites. According to Osborn et al. (2011), one reason may be lower level of health literacy, which is seen more in ethnic and minority populations than Whites. In another study by Kaplan, Billimek, Sorkin, Ngo-Metzger, and Greenfield (2013) that included different ethnic populations, the authors found that improving level

of disease state mastery erased any ethnic differences in glycemic control. Furthermore, according to Signorello et al. (2007), differences in diabetes prevalence between Blacks and Whites may be due more to other factors than race.

African American patients with T2DM continue to have higher mean A1C levels than patients who are White (Hausmann & Sevick, 2010). However, a longitudinal study of T2DM veterans by Egede et al. (2013) found that Blacks had lower mortality rates compared to Whites, Hispanics, and other races. One reason for this, according to Conway et al. (2015), is that Blacks have reduced mortality from respiratory and ischemic disease compared to Whites. Lower medication adherence has also been seen in Asian and Pacific Islanders, compared to Whites (Juarez, Tan, Davis, & Mau, 2014).

In summary, there is not a lot of information on diet, exercise, and medication treatment adherence when stratified by ethnicity and T2DM. What is known is that minority groups tend to be at higher risk than Whites for obesity and health issues. Also, while diet recommendations are often given to patients with T2DM, they are not tailored to their ethnic background. This leads to difficulty understanding what foods are healthy or what traditional foods can be made healthy, based on the ethnic background of the patient.

**Ethnicity and physician-patient relationships.** Physicians can vary in their approach to patients depending on their cultural or ethnic background. It is important that practitioners recognize the role that ethnicity and culture play when treating patients and to understand their impact on the treatment plan (Hickling, 2012). In a study using direct observation of patient visits with physicians, researchers found that the physicians

were less communicative and dominated the conversations more with African American patients than with their White patients (Johnson, Roter, Powe, & Cooper, 2004). Another study by Lepièce, Reynaert, van Meerbeeck, and Lorant, (2014) was conducted to evaluate physicians by giving the physicians two different scenarios. One group was given a non-minority patient case study and the other group a case study of a minority patient. Minority patients were prescribed more medications and had less time devoted to their other non-medical issues like social and relational history.

The physician-patient relationship is also affected by poor communication due to a tendency to approach all patients in the same way despite the patient's different cultural backgrounds (Mott-Coles, 2014). Physicians can stereotype patients, not understanding the cultural beliefs and mores of patients from other cultures, leading to miscommunication and poorer health outcomes. These disparities are seen across different health conditions including cancer, cardiovascular disease, and pain management (King et al., 2008). Ethnicity can also influence shared decision-making and trust (Peek et al., 2013). In summary, differences in ethnicity can affect the physician-patient relationship because of a lack of understanding of cultural backgrounds and poor communication on the part of both the physician and the patient. This can lead to stereotyping by the physician of the patient and a lack of trust in the physician by the patient.

### **Income**

**Income level and treatment adherence.** Income level can affect treatment adherence by making it easier or harder for patients to adhere to their treatment plan

depending on their income level. Income can affect diet choices in different ways. People with lower incomes may not have the resources like transportation to drive to supermarkets with higher quality food choices. They may choose lower quality foods based on price and convenience (Darmon & Drewnowski, 2008). Finding nutritious food in their neighborhood may be difficult and this is seen more in lower-income neighborhoods.

Another issue can be neighborhood safety. In some cases, residents of low-income neighborhoods may choose not to use stores in high crime areas, instead travelling further away. This can lead to the local stores lacking the revenue to carry healthier foods (Bader et al., 2010), or the residents may reside in a food desert. Food desert is a term used to describe areas where it is difficult to get nutritious and affordable food (Karpyn, Young, & Weiss, 2012). Neighborhood aesthetics, for example, food insecurity affects diabetes self-care behaviors including diet (Smalls, Gregory, Zoller, & Egede, 2015). For those with higher incomes, they are more likely to choose healthier foods (Darmon & Drewnowski, 2008). Therefore, it may be easier for those with higher incomes to live in neighborhoods where healthier foods are more prevalent.

Just as there can be lack of nutritious affordable foods in lower-income neighborhoods, there can also be a lack of places to exercise or concerns with safety if one were to go outside in lower-income neighborhoods. Chan (2016) reported that low-income neighborhoods are much more likely to lack recreational facilities. Even if they do have them, residents may lack the funds to join these facilities or they may be

concerned about the safety of the neighborhood. This can lead to less outside physical activity.

Evaluating the variables of income and medication adherence is not without challenges (Lyles et al., 2016). Issues with data can arise from individuals refusing to report their income. Older individuals may report less income because they are retired and income can be affected by expenditures that can vary from one individual to the next. Self-reporting of medication adherence can be skewed by individuals who over-report. Considering these variables, there have been some studies where income and adherence have been evaluated.

A study of non-Hispanic Whites, Vietnamese, and Mexican-American patients with T2DM was conducted where the researchers evaluated financial pressures and adherence. Low annual incomes and perceived financial burden led to non-adherence that was cost related, especially among the Mexican-American participants (Ngo-Metzger, Sorkin, Billimek, Greenfield, & Kaplan, 2012). While attempts have been made to treat T2DM, evaluating poverty and how it contributes to diabetes has not been addressed (Chaufan, Davis, & Constantino, 2011). However, another study by Billimek and August (2014) evaluating Mexican-American patients with T2DM was conducted to drill down further into medication adherence. The authors found that individual-level socioeconomic status was significantly associated with medication non-adherence that was cost related, but that neighborhood deprivation was significantly associated with the patients' medication beliefs.

Medication beliefs can include those about potential side effects or effectiveness. This may cause the patients to not take their medications correctly or to discontinue them, even if cost is not an issue. (Billimek & August, 2014). Therefore, while lower socioeconomic background can have a negative impact on medication adherence, income level and cost of medication are not the only factors to consider. Reducing costs of medications, if the patient does not believe that the medication is effective or will cause undue side effects, will not improve adherence (Billimek & August, 2014). The study authors helped to expose the need for a better understanding of the contributing factors to medication non-adherence. In summary, income level can have an impact on where people reside, the safety of their neighborhood, access to exercise facilities, transportation, and their ability to purchase healthy foods. This can affect diet, exercise, and medication adherence.

**Income and physician-patient relationship.** Physicians can act differently towards lower-income patients. Physicians are less likely to involve these patients in healthcare decisions, provide them with less education and show less affect. The patients are also less likely to ask questions (Willems, De Maesschalck, Deveugele, Derese, & De Maeseneer, 2005). One aspect of the physician-patient relationship, trust, can vary depending on the income level of the patient. Those with lower-income levels typically have more social distance from the physician and this can lead to a lack of trust, where the physician does not think that the patient will adhere to medication regimens; and where the patient is afraid to ask the physician questions (Schnittker, 2004).

Individuals who live in poverty are less likely to seek medical care and more likely to have chronic diseases. These patients can feel stigmatized, less respected, and judged by their physicians. In Loignon et al.'s (2010) study on physicians' social competence in the provision of care to persons living in poverty, they find that physicians can have a negative attitude with these patients.

### **Conclusion**

This study was conducted to examine the relationship between treatment adherence in patients with T2DM and potential physician factors that may affect their adherence. The review of literature included; search information, the state of T2DM and treatment adherence issues. Also discussed were the theoretical model of BPS and the self-efficacy theory, as well as, information on A1C, treatment adherence, and physician factors concerning patients with T2DM. Moderators of education level, age, ethnicity, and income were reviewed in the context of the independent (physician-patient relationship) and dependent (treatment adherence) variables.

There were some common themes found in the literature review. One was the challenge of having differences in measurements or type of measurements for medication adherence. Even the language could vary, with it being defined in some studies as medication adherence as compliance or persistence. There were also different types of measures too. Some studies included patients who self-reported while others utilized EMR or MPR, for example. Various studies had different ways of defining what medication adherence involved and varied cut-off points. Even with these differences, the overriding theme of this literature review is that there is still the need to identify

factors that will improve T2DM patients' medication adherence. A second common theme was the need for education that was tailored to the patient. Over and over in study conclusion sections, recommendations were made for the physician to understand their patients and their cultural and socioeconomic backgrounds, when giving education about T2DM, diet, exercise, and medication.

Not all patients newly diagnosed with T2DM are given medication. Some are given diet and exercise recommendations to follow. Following diet recommendations is a challenge for some patients if they live in food deserts where access to nutritious food is limited or if they cannot afford to eat nutritiously. Even age can be a factor if the patient is older and used to eating a certain way for many years. Exercising can be challenging for patients in lower socioeconomic neighborhoods due to safety issues or lack of transportation and local facilities. The present study was conducted to evaluate these sociodemographic variables along with physician communication to try and identify the most important drivers of treatment adherence.

The American Diabetes Association (ADA) publishes recommendations for the treatment of diabetes each year. In 2015, the overriding theme was the individualization of treatment for patients with diabetes. The ADA recommendations also included shared-decision making between the patient and physician, and understanding by the physician of the patient's ethnicity, comorbid conditions, likelihood of medication adherence and patient preferences (Romeo & Abrahamson, 2015). It is up to the physician to not only ensure that the patient understands his or her disease and the importance of managing it, but also the psychosocial context of the patient's everyday



life. This can only happen with good communications, trust, and respect between the physician and patient.

In conclusion, improving outcomes in T2DM patients may be helped along by a strong physician-patient relationship based on trust, respect, shared decision-making, and the patient feeling that he or she has been heard. Also, the physician should consider providing an environment where patients feel comfortable sharing their concerns or questions about their T2DM. Individualizing treatment for a patient, by taking a more holistic approach, is becoming more recognized as something that should be considered for better health outcomes. In Chapter 3, the research design, rationale for the study, methodology, ethical issues, and threats to validity are discussed. Also included are the research questions, instrumentation, and data analysis plan.

## Chapter 3: Research Method

### **Introduction**

This chapter covers the research design used to examine the potential relationship between physician factors and treatment medication adherence, measured using DSMQ scores. This section includes a description of the study's setting, sample participants, procedures, instrumentation, data analysis, and ethical considerations. Moderating factors that may affect the healthcare provider-patient relationship are also discussed, such as patients' education, age, ethnicity, and income level.

### **Purpose of the Study**

The purpose of this study was to identify potential physician factors that relate to treatment adherence in patients diagnosed with T2DM. Interventions to improve medication adherence might be a more effective approach to improve population health outcomes than the treatments themselves (Sabaté & WHO, 2003). This study adds to the literature by helping to identify these physician factors that may lead to a better understanding of what factors affect patient treatment adherence and in turn lead to solutions to help contribute to better patient health outcomes and reduced healthcare costs.

### **Research Design and Rationale**

This study was quantitative and correlational in design. The quantitative methodology was used to assess whether different factors associated with the physician-patient relationship showed a significant relationship with DSMQ scores in T2DM. Data were collected by having study participants complete two surveys: A patient survey

addressing level of satisfaction of their physician based on questions from the CAHPS Clinician and Group Survey, as well as supplemental items from the CAHPS Adult Surveys. There were some minor changes made to the survey that are discussed in the instrumentation section. The second survey, the DSMQ, was included to capture treatment adherence questions (see Appendix A).

A correlational approach was determined based on the potential relationship between physician factors and patient treatment adherence. For this study, scores on the surveys were the predictor variable and self-reported measures from the DSMQ was the outcome variable. The hypothesis was that patients who gave their physicians higher scores on provider care would have seen improvements in treatment adherence over at least a year or more. The DSMQ survey was used to identify types of treatment that the patient had received related to diet, exercise, medication, or a combination of these treatments for their T2DM.

The following five research questions were addressed using the quantitative methodology to determine if there was a relationship between physician-patient relationships and patient treatment adherence as measured by scores on the DSMQ:

***RQ1:*** Among patients (ages 18+) with T2DM, is there a significant relationship between treatment adherence as measured by scores on the DSMQ, and the patients' scores on physician-patient satisfaction surveys for patients with T2DM?

***H<sub>01</sub>:*** Among patients (ages 18+) with T2DM, there is no significant relationship between scores on the DSMQ and scores on physician-patient satisfaction surveys.

*H<sub>A1</sub>*: Among patients (ages 18+) with T2DM, there is a significant relationship between scores on the DSMQ and the patients' scores on physician-patient satisfaction surveys.

***RQ2***: Does age moderate the relationship between patient satisfaction scores and treatment adherence?

*H<sub>02</sub>*: There is no moderating effect of age on the relationship between patient satisfaction and treatment adherence.

*H<sub>A2</sub>*: There is a moderating effect of age on the relationship between patient satisfaction and treatment adherence.

***RQ3***: Does level of education moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>03</sub>*: There is no moderating effect of level of education on the relationship between patient satisfaction and treatment adherence.

*H<sub>A3</sub>*: There is a moderating effect of level of education on the relationship between patient satisfaction and treatment adherence.

***RQ4***: Does ethnicity moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>04</sub>*: There is no moderating effect of ethnicity on the relationship between patient satisfaction and treatment adherence.

*H<sub>A4</sub>*: There is a moderating effect of ethnicity on the relationship between patient satisfaction and treatment adherence.

**RQ5:** Does income moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>05</sub>:* There is no moderating effect of income on the relationship between patient satisfaction and treatment adherence.

*H<sub>A5</sub>:* There is a moderating effect of income on the relationship between patient satisfaction and treatment adherence.

A multiple regression analysis was conducted to assess the moderator variables of education, age, income and ethnicity. Much of the published literature is on either the patient factors or on the patient and physician-related factors associated with T2DM, but there is a lack of studies on factors with just the physician-patient relationship and medication adherence. An online survey approach along with paper-and-pencil surveys was planned to efficiently collect the data in a timely manner. This also helped to broaden the pool of participants geographically to improve generalizability of the findings. There were only two clinics where data was collected, thus these results cannot be generalized to other clinics or other parts of the country. Also, only English-speaking participants were recruited, which eliminated participants that spoke other languages. The online surveys were captured from different parts of the country.

## **Methodology**

### **Population**

The participant inclusion criteria for this study consisted of male and female patients who had been diagnosed with T2DM, ages 18-75+ and who had been in treatment for at least 12 months. Participants were excluded if they have been in

treatment for less than 12 months, were under the age of 18, or could not read or write English. Flyers were provided to recruit participants, with contact person information for the paper-and-pencil participants or website information for the online participants.

### **Sampling and Sampling Procedures**

Effect size was determined by examining the literature on this study's topic. It is important to report effect size because it indicates the magnitude of the difference between groups (Sullivan, & Feinn, 2012). Haskard-Zolnierek and Dimateo (2009) conducted a meta-analysis evaluating studies on physician communication and patient treatment adherence and found an overall effect size of  $r = .19$  in 106 studies that had evaluations of the communication. This is considered a small effect size, but in line with other studies or better. The effect sizes in these studies were measured using a Pearson, point-biserial, or a Phi coefficient. For studies included in the meta-analysis where an effect size was not reported, the authors calculated the Phi coefficient. For purposes of this study, an effect size of .15 was chosen, as this is considered a medium effect size by Cohen (1992).

To determine sample size, an estimated effect size and power needed to be calculated (Sullivan & Feinn, 2012). Power is related to the strength of a study to detect a difference, if there is really a difference. The more the power is increased in a study, the more likely that an effect will be correctly detected. The higher the power, the less of a chance of a Type II error, defined as  $1-B$  (Sullivan & Feinn, 2012).

To calculate the number of participants, the G\*Power calculator (Faul, Erdfelder, Buchner, & Lang, 2009) was used to determine an appropriate sample size for multiple

regressions. Having determined an effect size of .15, a statistical power of .80, five-predictor variables, (CAHPS scores, education, age, ethnicity, and income) and a probability level of .05, the minimum sample calculated was 92. The incidence of diabetes in the United States adult population is 9% and T2DM accounts for 90-95% of those cases Centers for Disease Control [CDC], 2014b). This means that between 8.1–8.55% of the adult population currently has T2DM diabetes. Overall, according to the ADA (2016), there are 29.1 million Americans who have diabetes, but only 21.0 million have been diagnosed. (ADA, 2016). Based on the American Diabetes Association's (2016) estimate of 21.0 million patients diagnosed with diabetes, if 95% have T2DM, then this segment of the population equals 19.95 million individuals.

A minimum sample of 92 participants was needed for a confidence level of 95%, power of 80% and a  $p$  (degree of variability) = 0.05. To account for subjects who may not have completely filled out the surveys, an extra 30% of participants would have needed to be recruited. There were very few respondents for this study who did not fill out the surveys completely and there were very few survey questions left unanswered. Therefore, the final count of 92 participants was sufficient and additional participants were not recruited.

### **Participants**

Participants, ages 18 and older, were recruited using a convenience sample of individuals diagnosed with T2DM and who had been treated for at least 12 months. The surveys were available to complete on SurveyMonkey, which is an online survey company where surveys can be uploaded or created to reach a certain target audience.

Data collected through SurveyMonkey Audience can be integrated into SPSS. Surveys can be completed via mobile, the internet, and social media. There are millions of potential participants. SurveyMonkey also offers the option to HIPAA-enable the account if there is a need to do so, offering enhanced privacy and security (SurveyMonkey, 2016b). In addition to SurveyMonkey Audience, participants were recruited from two clinics, one in Louisiana and one in Texas. Paper-and-pencil surveys were available for participants that were unable to access the Internet. This ensured that both participants with access to the Internet and those without access to the Internet were included. Survata, an online participant recruitment site, was also used. Survata conducts research with surveys (Survata, 2017), and was able to access participants who fit the criteria for this study. The online SurveyMonkey survey questions were entered into the Survata system so that the online participants were all accessing the same online survey. The results were downloaded from Survata into SPSS.

### **Data Collection**

Data Collection occurred through social media, and two clinics, one in Louisiana and one in Texas. The clinic in Louisiana is a nonprofit group that works with patients to help educate them on managing their diabetes by offering monthly classes on a variety of health-related topics and conducting group exercise activities. Some of the health-related topics include those on nutrition, behavior, foot health, and glucose meter checks. The Louisiana clinic staff agreed to participate in this study, and their patients vary in age from young adults to the elderly and many of them do not have access to the Internet. The clinic in Texas sees a large percentage of adult patients who have been diagnosed



with diabetes. Some of these adult patients agreed to participate in this study, and they preferred paper-and-pencil surveys. Recruiting individuals from different sites helped ensure a greater cross-section of participants. The goal was to have participants from different age groups, ethnicities, income levels, and educational backgrounds to better detect any changes in the study variables.

Participants were recruited by posting flyers, from social media networks and Walden University. A paragraph outlining the study with a link to SurveyMonkey was listed on the social media sites and the TPA website. Recruiting individuals from Facebook, Survata, Nextdoor, and the Walden Participant Pool helped ensure a greater cross-section of participants. The invitation to participate for Facebook, Nextdoor, and the Walden Participant Pool can be found in Appendix B. Data from the paper-and-pencil surveys were entered by hand into SPSS and included in the online dataset.

Included with both the online surveys and the paper-and-pencil surveys was a cover page with a section on informed consent, an explanation of the study, and information letting the study participant know their participation was voluntary and they could decide not to be a part of the study at any time. Informed consent forms were obtained from all participants. Demographic information on age, gender, education level, race, and income were captured from the CAHPS survey questions 42-47.

Some additional questions were added to the survey. One question was added on whether other individuals help in the management of the participant's T2DM and a follow-up question on how helpful these other individuals were. An income question adapted from the SurveyMonkey Audience website was added: "What is your yearly

household income?” This question includes seven different ranges of income from <\$24,999 to >\$100,000 (SurveyMonkey, 2016b). Lastly, an additional question was added on where the participant heard about the survey. Data on treatment adherence, the outcome variable, were captured by the questions on the DSMQ.

### **Instrumentation**

The CAHPS version is a measure of patient satisfaction of his or her healthcare provider. The CAHPS surveys are part of the CAHPS program that is overseen and funded by the Agency for Healthcare Research and Quality [AHRQ] (2016b). Several public and private organizations have partnered with CAHPS to oversee and use these surveys. This has helped to provide a unifying thread for the different parts of the overall healthcare system (Milleson, & Macri, 2012). Permission is not required to use the CAHPS surveys or the supplemental items for the surveys (AHRQ, n.d.). The CAHPS<sup>®</sup> Survey 2.0 includes 34 core questions with the ability to add in other supplemental questions including those on chronic conditions, provider communications, cultural competence, health improvement, health literacy, prescriptions, and shared decision making. Questions from the CAHPS<sup>®</sup> Clinician and Group Surveys Supplemental Items for the Adult Surveys 2.0 also were included. These supplemental items included questions on the topics of cultural competence, health literacy, shared-decision making, and communication with providers (AHRQ, 2016b).

The CAHPS Clinician and Group Surveys include four measures: information on the provider, care from the provider, questions about office staff behaviors, and demographic questions. There are four response types in the CAHPS survey. These

include: yes/no, global rating of 0-10, how often or other 4-point response scale, and 3-point response scale (AHRQ, 2016b). The survey questions used in this study only included information on the provider, care from the provider, and demographic questions, along with some of the corresponding supplemental questions.

The addition of the supplemental questions to the survey questions resulted in 36 questions used to measure the physician-patient relationship. These CAHPS questions included the domains of: (1) how well the provider communicated with the patient, (2) patient rating of the provider, (3) cultural competence of the provider and being polite and considerate, (3) rating of patient trust in the provider, (4) health literacy, (5) health improvement, (6) patient centered home, and (7) shared decision making (AHRQ, n.d). Composite scores can be assessed from domains one and three. The overall score from the 36 questions was used to address Research Question 1. The CAHPS survey demographic information was used to address the moderator variables in Research Questions 2-5. These moderator variables were age, education, income, and race. The researcher also included a question on other individuals in the physician's office that assisted with the participant's diabetes care and a question on how the participant heard about the survey.

### **Physician-Patient Relationship**

The physician-patient relationship measures was captured from questions on the CAHPS survey. There were several questions from both the main and supplemental surveys. These questions included information on the provider's behavior towards the patient, and how well the provider communicated with and listened to the patient. The

physician-patient relationship plays an important part in the treatment of patients. Components that make up this relationship include communication, level of trust between the provider and patient, active listening, and level of shared decision-making between the provider and patient on treatment (Lipkin, Putnam, & Lazare, 1995). These questions were evaluated both as one overall score and as composite scores.

Sometimes the physician will have other staff work with the patients after they have been diagnosed with T2DM. Therefore, question #39 was included in the CAHPS survey to capture any other health care providers or staff. Question #40 is a rating scale on how helpful the participant found this or these individual(s). Other healthcare providers include physician assistants and nurse practitioners that prescribe treatment regimens to patients diagnosed with T2DM (Centers for Medicare and Medicaid Services [CMS], 2006). Other staff and allied health professionals may include nurses, pharmacists, diabetes educator, health coach, or dietician. Allied health professionals are individuals who may interact with patients that are not nurses, pharmacy, or medical personnel. They may be involved in the management of patients with chronic diseases like diabetes (Association of Schools of Allied Health Professionals [ASAHP], 2017).

### **Moderator Variables**

The moderator variables of education, age, and ethnicity were addressed from questions in the CAHPS survey. Income level, the fourth moderator variable, was also added to the survey. The supplemental questions followed much the same format as the core survey ones. Included were questions answered: Yes or No, Never, Sometimes, Usually, and Always, as well as some that are answered Yes Definitely, Yes, Somewhat,

and No or Not At All, A Little, Some or A Lot (AHRQ, 2016b). The moderating variables of age, education, ethnicity, and income are discussed next.

**Age.** Age was captured by question #42 from the CAHPS survey. This question has a box where the participant filled in his or her age.

**Education.** Education level was captured by question #44 in the CAHPS survey. This survey question was stratified into six categories from completing up to an 8<sup>th</sup> grade education or less to having completed a four-year college degree or more.

**Ethnicity.** Ethnicity was captured by questions #45 and #46 in the CAHPS survey. Question #45 asked whether the participant was Hispanic or Latino and was answered yes or no. Question #46 asked the race of the participant. There were six possible answers including the reply “other.” The participant checked one or more of the answers.

**Income.** Income was captured by question #47 in the CAHPS survey. Income level choices varied from <\$24,999 to >\$100,000.

The psychometric properties of the CAHPS survey were assessed using both a cognitive and a psychometric approach. Cognitive testing allows for evaluation of how well respondents comprehend and answer the questions, helps evaluate response choice adequacy, and helps with optimal word selection for the surveys. Field-testing was done for measuring reliability and validity. The goal of this dual approach was to ensure the best survey possible (AHRQ, n.d.).

The reliability of the CAHPS<sup>®</sup> Clinician and Group Survey is estimated to be at least 0.70 for most of the ratings and composites, but these can vary depending on the

group of providers (AHRQ, 2016b). The CAHPS surveys are the most often used surveys to evaluate consumer experience with health plans and providers in the ambulatory setting. The survey questions are grouped into five composites to make it easier for patients to understand. Reliability of the CAHPS<sup>®</sup> 2.0 survey is high (.70) and internal consistency ranged from a high of Cronbach's alpha  $\geq .75$  to a low of .58 depending on the composite selected (Hargraves, Hays, & Cleary, 2003). There are also psychometric data available on the CAHPS<sup>®</sup> supplemental surveys. For example, the cultural competence supplemental item set has been evaluated and the internal reliability ranged from 0.58 to 0.92, and a confirmatory factor analysis that supported the validity of the item set (Weech-Maldonado et al., 2012).

The Agency for Healthcare Research and Quality (2016b) has stringent requirements surrounding the use of the surveys. Questions can be added to the survey, but none of the core questions can be modified or removed because of the AHRQ goal of standardization. If questions are modified, the survey cannot be referred to as a CAHPS<sup>®</sup> survey. This study used questions from both the CAHPS Survey and the supplemental surveys, along with demographic questions.

### **Diet, Exercise, and Medication Adherence**

The DSMQ measures self-care activities for the previous eight weeks. The DSMQ was designed to address a gap seen with other diabetes self-management questionnaires that are unable to explain changes in A1C levels effectively (Schmitt et al., 2013). There are 16 questions with four response choices from "Applies to me very much" (3 points) to "Does not apply to me" (0 points). The survey has seven questions

that are formulated positively and nine that are formulated negatively. When scoring, the negative questions are reversed to indicate increased self-care for when the item values are higher. There are four subscales: Glucose Management, Dietary Control, Physical Activity, and Health-Care Use. Question 16 is included in the overall sum score but is not a part of the subscales (Schmitt, et al., 2013).

The DSMQ was used to capture data for the outcome treatment adherence variables of diet, exercise, and medication adherence (see Appendix A). The questions under the subscale dietary control measured diet adherence. The questions under the physical activity subscale measured physical activity, and medication adherence was measured with the glucose management scale. The DSMQ consists of 16 questions recorded in a four-point Likert scale (3=applies to me very much, 2=applies to me to a considerable degree, 1=applies to me to some degree, 4=does not apply to me). Some of the questions require reverse scoring and five of the questions have an additional choice, for example, blood sugar measurement is not required as a part of my treatment. The DSMQ can also be divided into four subscales that measure (a) dietary control, (b) glucose management, (c) physical activity, and (d) physician contact. The overall DSMQ score was used to address Research Questions 1-5.

To evaluate psychometric properties, the DSMQ was compared to an established scale, the Summary of Diabetes Self-Care Activities Measure (SDSCA) in 261 patients with either Type 1 or Type 2 diabetes. Significant convergent correlations of the DSMQ subscales were seen with the SDSCA parallel scales. However, correlations with A1C were found to be better with the DSMQ scales than the parallel scales of the SDSCA.

Internal consistency of the DSMQ was good with an overall Cronbach's alpha of 0.84. The subscales were also good and ranged from 0.77 to 0.60. According to Schmitt et al. (2013), the DSMQ is a reliable and valid test to assess diabetes self-care management when evaluating glycemic control.

### **Data Analysis**

Data analyses were conducted using SPSS version 24. Survey responses from both the online surveys and the paper-and-pencil surveys were collected and checked to ensure that they had been filled out completely. Any incomplete surveys filled out by participants were addressed by using the SPSS pairwise missing values procedure. This procedure allows for the inclusion of the subject's other responses, instead of completely removing the subject from the analysis. George and Mallery (2016) recommended that if there is more than 15% of the data missing, whether from the individual subject, or a variable, that it be dropped from the analysis.

Prior to data analysis, a test of multicollinearity was performed. Multicollinearity can occur if two or more of the variables are correlated in the regression model. Field (2009) points out that low levels of correlation are common, but strong correlations can lead to difficulties in assessing contribution of predictor variables, limit size of R, and increase standard errors of *b* coefficients.

A multiple regression analysis was planned to see if the moderator variables of age, education, ethnicity, and income have an effect on the relationship between physician-patient relationship and patient treatment adherence. According to Hayes (2013), moderation (interaction) analysis helps to determine the size and effect that the



moderator variables may have on the relationship between the independent and dependent variable. Moderator variables may affect direction, strength, or the relationship between the independent and dependent variable (Baron & Kenny, 1986).

Research Questions 1-5 were answered by using the results from the CAHPS survey which included patient satisfaction measures and demographics. The DSMQ results, which is the outcome variable, were analyzed to determine patient treatment adherence, stratified into diet, exercise, and medication adherence. The DSMQ also included response boxes where the participants could check that a measurement was not part of their treatment (Schmitt et al., 2013). For example, a participant may have been prescribed diet and exercise, but not medication.

### **Threats to Validity**

Threats to both internal and external validity can occur. The participants who complete the survey might decide not to be factual or not complete the survey. They may not feel comfortable giving more negative scores as responses to questions about their healthcare provider, or the provider's office staff. It may be difficult to recruit a diverse group of participants, as only a small percentage of people participate in research. This percentage is even lower in minority groups (Moyer, 2009).

Another threat to validity is multiple submissions online. These can be prevented because SurveyMonkey has software that has multiple responses turned off by default. If someone tries to respond to the same survey again, they are prevented from doing so (SurveyMonkey, 2016a). Since the participants remained anonymous, no participants were tracked by email address or IP address and no personal identifying information such as their name were collected.

Since this study was based on a correlational design, one threat to the internal validity may be that the hypothesized correlation between the physician-patient relationship and medication adherence may be affected by other variables that moderate the relationship. An external threat to validity may be that the results from the participants surveyed for this study will not be reproducible in other patient populations. However, providing the option to complete a paper survey helped to ensure participation by participants that did not have access to the internet. In 2011, it was estimated that about 16% of Americans did not have any access to the Internet (USCB, 2015a), and

these individuals were more likely to be poorer, minority, low income, and or older. It was important to capture some of these participants as well because of the survey questions and moderator variables.

### **Ethical Issues**

Ethical considerations for this study were addressed utilizing the American Psychological Association's (2010) "Ethical principles of psychologists and code of conduct," the Health Insurance Portability and Accountability Act of 1996 (HIPAA), and the Walden University's Institutional Review Board (IRB) guidelines. The American Psychological Association (APA) guidelines contain several ethical standards to follow when conducting research. These include the need for IRB approval, informed consent and release of data once published, if requested by other professionals, as long as confidentiality can be maintained. Results from the CAHPS<sup>®</sup> Clinician and Group Survey, if not altered, can be uploaded and added to the growing database of research using these surveys, which is then made available to other researchers. If this occurs, no identifying information of the participants would be included. Additionally, other ethical considerations surrounding the informed consent by the participants, were that the informed consent include information about the research purpose, duration, procedures, potential benefits and risks of being a part of the research, confidentiality, rights, and the participant's option to withdraw from the study even if the research has started (APA, 2010). Also included in the informed consent was contact information for the participants. This contact information allowed them to contact Walden's IRB, the researcher, or the researcher's advisors, if they had any questions or concerns.

Additionally, the informed consent included some resources to review from the websites of the American Diabetes Association and the Mayo Clinic for the patient to access if they required more support.

The participants' protected health information (PHI) and personal identifying information were not collected. This ensured participant privacy. The HIPAA Privacy Rule states that PHI created or maintained by covered entities like hospitals or health care plans cannot be released without certain conditions being met. Even a researcher who is not part of the covered entity may have to abide by the Privacy Rule if he or she collects data from a covered entity (National Institutes of Health, 2007). Some of the surveys collected for this study may come from covered entities like healthcare clinics. No participants were harmed by participating in this survey and no follow-up with the participants occurred.

The computer used during the data collection process and analysis was password-protected and only the researcher had the password. Data collected was and will be kept secure in a fire proof safe. No identifying patient information was collected in this process and each of the completed surveys was assigned a unique code for SPSS input.

### **Summary**

This chapter included information on the study design, rationale for conducting the study, inclusion criteria for participant recruitment, instruments and data analysis. The data analysis was conducted to see if there was a correlation between scores on the survey and medication adherence, as measured by changes in DSMQ scores, while evaluating the moderator variables of education, ethnicity, age, and income. Also

included were the research questions, ethical considerations and potential threats to validity. In Chapter 4, the results of the data analyses are discussed along with any significant findings.

## Chapter 4: Results

### Introduction

The purpose of this quantitative study was to examine the relationship between the level of patient satisfaction with their healthcare provider and treatment adherence among a sample of patients with T2DM. Also examined were the potential moderating effects of age, education, ethnicity, and income. Data were obtained from participant responses on two surveys. Responses on questions from the CAHPS survey provided data on the physician-patient relationship and the moderator variables. Responses on the DSMQ provided data on treatment adherence with T2DM. Participants completed these surveys either online through SurveyMonkey or Survata or through paper-and-pencil surveys at designated medical offices. Data were analyzed using SPSS 24 software to answer the following research questions:

***RQ1:*** Among patients (ages 18+) with T2DM, is there a significant relationship between treatment adherence as measured by scores on the DSMQ, and the patients' scores on physician-patient satisfaction surveys for patients with T2DM?

***H<sub>01</sub>:*** Among patients (ages 18+) with T2DM, there is no significant relationship between scores on the DSMQ and scores on physician-patient satisfaction surveys.

***H<sub>A1</sub>:*** Among patients (ages 18+) with T2DM, there is a significant relationship between scores on the DSMQ and the patients' scores on physician-patient satisfaction surveys.

**RQ2:** Does age moderate the relationship between patient satisfaction scores and treatment adherence?

*H<sub>02</sub>:* There is no moderating effect of age on the relationship between patient satisfaction and treatment adherence.

*H<sub>A2</sub>:* There is a moderating effect of age on the relationship between patient satisfaction and treatment adherence.

**RQ3:** Does level of education moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>03</sub>:* There is no moderating effect of level of education on the relationship between patient satisfaction and treatment adherence.

*H<sub>A3</sub>:* There is a moderating effect of level of education on the relationship between patient satisfaction and treatment adherence.

**RQ4:** Does ethnicity moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>04</sub>:* There is no moderating effect of ethnicity on the relationship between patient satisfaction and treatment adherence.

*H<sub>A4</sub>:* There is a moderating effect of ethnicity on the relationship between patient satisfaction and treatment adherence.

**RQ5:** Does income moderate the relationship between patient satisfaction and treatment adherence?

*H<sub>05</sub>:* There is no moderating effect of income on the relationship between patient satisfaction and treatment adherence.

*H<sub>45</sub>*: There is a moderating effect of income on the relationship between patient satisfaction and treatment adherence.

Statistical tests using correlational and multiple regression analyses were used to test the hypotheses. In this chapter, data collection will be discussed, along with participant demographics, quantitative analyses, and interpretations of the data.

### **Data Collection**

There were 92 participants, of which 80 were online and 12 completed paper-and-pencil surveys. Data for this study were initially collected using either the SurveyMonkey platform or paper surveys. Participants were recruited from Facebook, Nextdoor, the TPA, and the Walden University's participant pool. The Louisiana clinic participants were provided with paper surveys and flyers so that the participants could choose to fill out a paper or online survey. There were 10 participants from this clinic. After several weeks, the study accrual of participant responses fell short of what was required and the decision was made to work with another online survey company, Survata as well as, another clinic located in Texas. This clinic had two participants that filled out surveys. With these additional sources, I was able to recruit the additional participants needed for the study, with a significant portion of the surveys coming from Survata ( $n = 71$ ).

Both the online and paper surveys included an informed consent form. Online participants clicked on a link provided by the researcher. Paper surveys were placed in self-addressed stamped envelopes along with the informed consent form. To qualify for the study, participants had to be at least age 18 or older, diagnosed with T2DM for at



least a year, and seen their physician at least once in the previous year. A total of 92 participants were needed for the study. SurveyMonkey surveys were downloaded directly into SPSS version 24. Survata surveys were downloaded into Microsoft Excel and then transferred to SPSS. Paper surveys were transcribed manually into SPSS by the researcher.

### **Demographic Characteristics**

There were 92 responses, which was the minimum amount of responses needed for the study according to the power estimation reported in Chapter 3. The sample consisted of 55 (59.8%) females and 37 (40.2%) males (see Table 1). The age range of the participants was 23-81 years of age. The racial distribution of this sample was not a true representation of the United States population. Most of the study participants were White, 80.4% versus the 2016 U. S. Census estimate of 61% (USBC, 2017).

A large percentage of the participants had attended some college, graduated, or had post-graduate training. Almost 60% of the participants reported incomes of \$50,000 per year or higher. Regarding how long the participants had been seeing their physician, approximately 65% of the participants reported seeing the same physician for three to five years or more. Finally, a question was asked about other individuals who were involved in the participants' treatment for T2DM. Only three participants reported that there were no other individuals involved in their T2DM treatment.

Table 1

*Demographic Characteristics of the Study Participants (N= 92)*

<b>Characteristics</b>	<b>Number</b>	<b>%</b>
<b>Gender</b>		
<b>Male</b>	37	40.2
<b>Female</b>	55	59.8
<b>Age</b>		
<b>18-29</b>	7	7.6
<b>30-44</b>	25	27.2
<b>45-59</b>	34	37.0
<b>60-74</b>	23	25.0
<b>75+</b>	3	3.3
<b>Race</b>		
<b>White</b>	74	80.4
<b>Black or African American</b>	8	8.7
<b>Asian</b>	4	4.3
<b>Native Hawaiian or Other Pacific Islander</b>	0	0.0
<b>American Indian or Alaskan Native</b>	3	3.3
<b>Other</b>	3	3.3
<b>Ethnicity</b>		
<b>Hispanic</b>	12	13.1
<b>Non-Hispanic</b>	75	81.5
<b>Unknown</b>	5	5.4
<b>Education Level</b>		
<b>8<sup>th</sup> grade or less</b>	0	0.0
<b>Some high school, but did not graduate</b>	2	2.2
<b>High school graduate or GED</b>	11	12.0
<b>Some college or 2-year degree</b>	35	38.0
<b>4-year college graduate</b>	29	31.5
<b>More than 4-year college degree</b>	15	16.3
<b>Income</b>		
<b>&lt;\$24,999</b>	18	19.6
<b>\$25,000-\$49,999</b>	38	41.3
<b>\$50,000-\$99,000</b>	18	19.6
<b>&gt;\$100,000</b>	3	3.3

<b>Prefer not to answer</b>		
<b>Table 1 Demographic Characteristics of the Study Participants (N= 92)</b>		
<b>(continued)</b>		
<b>Length of time seeing the physician</b>		
Less than 6 months	6	
At least 6 months but less than 1 year	18	6.5
At least 1 year but less than 3 years	8	19.6
At least 3 years but less than 5 years	24	8.7
5 years or more	36	26.1
		39.2
<b>Number of visits previous 12 months</b>		
1 time	10	10.8
2 times	30	32.6
3 times	20	21.8
4 times	22	23.9
5 to 9 times	8	8.7
10 or more times	2	2.2
<b>Other Individuals Involved in T2DM Management</b>		
Nurse Practitioner	26	28.3
Physician Assistant	23	25.0
Diabetes Educator	18	19.6
Dietician	17	18.5
Health Coach/Psychologist/Behavioral health	5	5.40
Pharmacist	22	23.9
Other Medical Staff	17	17.7

### **Instrumentation**

Questions from the CAHPS as well as questions from the CAHPS Supplemental Items were used to capture information about the physician-patient relationship and demographic information. The DSMQ (Appendix A) was used to capture patient treatment adherence for their T2DM.

### **Assumptions Testing**

Analysis testing was conducted for reliability and internal consistency of the CAHPS and the DSMQ with Cronbach's coefficient alpha. Cronbach's alpha coefficient is a measure of the reliability of a test. According to Cronbach (1951), if a test has factors that can be added into subscales then these composite scales should be analyzed too. Many sources report that a Cronbach's alpha coefficient of .7 or .8 is considered acceptable, but sometimes the diversity of the constructs can lead to lower values that are still within an acceptable range (Field, 2009).

The Cronbach's alpha coefficient for the CAHPS survey was (.88). The Cronbach's alpha coefficient for the DSMQ was (.78). This is in line with a study by Schmitt et al. (2013) on the development of the DSMQ, overall ( $\alpha = .84$ ), with the subscales varying from  $\alpha = .77$  to  $\alpha = .60$ .

Skewness and kurtosis scores are used to determine normality of the distribution. A skewness score of 0 is ideal, but scores can vary from -1 to +1 and still be acceptable (George & Mallery, 2016). Skewness is a measure of the symmetry of the scores, while kurtosis is a measure of shape of the distribution (Field, 2009). Kurtosis scores from -2 to +2 are still considered acceptable (George & Mallery, 2016). Tests for the skewness and kurtosis of the patients' level of satisfaction with the provider scores (CAHPS) and the patients' T2DM treatment adherence scores (DSMQ) were run. The assumption of normality was met for both variables. The results are shown in Table 2.

Table 2

*Mean, Standard Deviation, Range, Skewness, and Kurtosis for Study Measures (N=92)*

	M	SD	Actual Range	Potential Range	Skewness	Kurtosis
CAHPS	8.42	1.10	4.28-9.75	0-10	-1.26	1.40
DSMQ	7.56	1.53	3.30-10.0	0-10	-.670	-.682

Linear regression statistics were run to assess for multicollinearity of the variables, including the dependent, independent, and moderator variables.

Multicollinearity can occur when the relationship between two variables are too closely linear related. The variance inflation factor (VIF) is used as a measure of multicollinearity (Field, 2009). SPSS was used to measure multicollinearity. Each of the variables was placed in the dependent variable box, one a time, DSMQ, CAHPS, age, education, ethnicity, and income, while the others were placed in the independent variable box and compared. The VIF range was from 1.0 to 1.4. These numbers are acceptable and do not indicate that there are any concerns with multicollinearity for the study variables. A VIF of 10 or more is considered high and a concern, as well as a tolerance of .2 or lower can be of concern (Fields, 2009).

According to Hayes's (2013) regression-based approach, the assumption of homoscedasticity refers to the predictor variable values all having the same variance around the regression line. To test for homoscedasticity, scatter plots were created and evaluated. Homoscedasticity was confirmed. To evaluate the distribution of the data,

boxplots were conducted on the independent and dependent variables. Outliers are scores that differ from the rest of the scores. Outliers can distort the data and bias the model (Field, 2009). There was one outlier in the independent variable group. After examining the interquartile ranges, using descriptive statistics in SPSS, the outlier was determined to be a mild outlier. A regression analysis was conducted with and without the outlier value and it was determined that there was a negligible effect on significance and therefore it was retained.

## Study Results

### Alternative Hypothesis 1

The first alternative hypothesis was that there would be a significant relationship between treatment adherence (as measured by scores on the DSMQ) and the patient's scores on the CAHPS for patients with T2DM. A Pearson correlation two-tailed test of significance was conducted ( $\alpha = .05$ ). The results indicated that the null hypothesis could be rejected because there was a significant correlation between the patients' level of satisfaction with the provider and patient treatment adherence ( $r = .37, p < .001$ ). Increased scores on the CAHPS were correlated with better T2DM treatment adherence. According to Cohen (1992), an  $R^2$  of .14 represents a medium effect size and a moderate correlation, while a  $p$  value of  $p < .001$  signifies that this relationship is statistically significant.

The CAHPS survey can also be stratified into composite scores as indicated in Chapter 3. Two composite scores were examined, 1) how well the providers communicated with the patient, and 2) providers are polite and considerate. A Pearson correlation two-tailed test of significance was conducted to analyze both of the composite scores. There were significant correlations found between how well the provider communicated with the patient and their treatment adherence ( $r = .32, p = .002$ ), and how polite and considerate the provider was and patient treatment adherence ( $r = .28, p = .006$ ). A summary of these results can be found in Table 3.

Table 3

*DSMQ, CAHPS and CAHPS Composite Scores: Correlations and Descriptive Statistics*

*(N = 92)*

Variables	1	2	3	4
1. DSMQ	--			
2. CAHPS	.369**	--		
3. Communication	.317**	.904**	--	
4. Politeness	.282**	.856**	.772**	--
Variables	1	2	3	4
<i>M</i>	7.6	8.4	8.7	8.8
<i>SD</i>	1.53	1.10	1.43	1.50

\*  $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

### Alternative Hypotheses 2-5

Variables that can affect the relationship between two other variables are known as moderators. To estimate this, an interaction term (CAHPS x moderator) is added to the regression model (Laerd, 2013; see Figure 1). Alternative hypotheses 2-5 included the moderating variables of age, education, income, and race. Hayes's (2013) macro PROCESS version 2.16.3 was used to assess moderation. The macro PROCESS is based on an ordinary least squares (OLS) regression-based path analysis. To use this approach,



the assumption is made that the variables are continuous, fixed effects, and no random measurement error (Hayes, 2013).

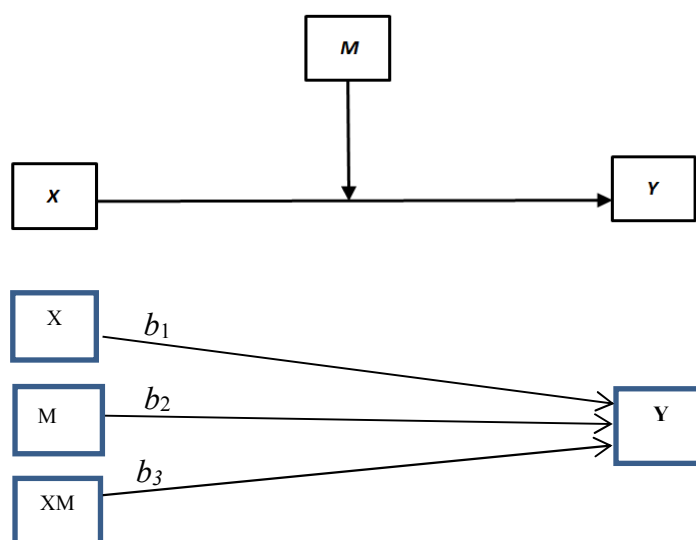


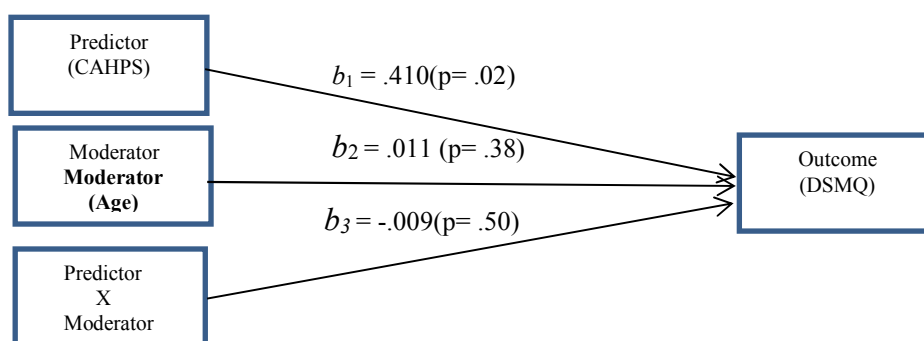
Figure 1. PROCESS Model 1 conceptual and statistical diagram. Source: Hayes (2013).

### Alternative Hypothesis 2

The second alternative hypothesis was that age would moderate the relationship between treatment adherence and the patient's scores on physician-patient satisfaction surveys for patients with T2DM.

**Age.** To test the hypothesis that age moderates the relationship between the level of patients' satisfaction with their provider and their T2DM treatment adherence, a regression was conducted using PROCESS. The variable "age" was entered as a continuous variable, the independent variable (CAHPS) scores were entered, and the

dependent variable (DSMQ) scores were entered, using Model 1 in PROCESS. The overall model was statistically significant,  $R^2 = .146$ ,  $F(3, 88) = 6.02$ ,  $p = .001$ . However, the interaction between the CAHPS scores and age was not statistically significant, ( $b = -.009$ ,  $t(92) = -.675$ ,  $p = .50$ ). These results suggest that age does not moderate the relationship between level of patients' satisfaction with their provider and their T2DM treatment adherence. Therefore, the null hypothesis cannot be rejected. A summary of the findings is depicted in Figure 2.



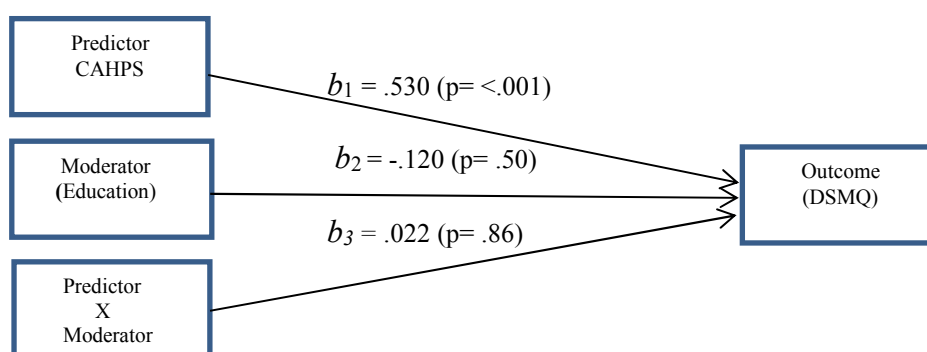
*Figure 2.* Model of physician-patient relationship and patient treatment adherence moderated by age

### Alternative Hypothesis 3

The third alternative hypothesis was that education would moderate the relationship between treatment adherence and the patient's scores on physician-patient satisfaction surveys for patients with T2DM.

**Education.** To test the hypothesis that education moderates the relationship between the level of patients' satisfaction with their provider and their T2DM treatment adherence, a regression was conducted using PROCESS. The variable "education" was

entered as a continuous variable, the independent variable (CAHPS) scores were entered, and the dependent variable (DSMQ) scores were entered, using Model 1 in PROCESS. The overall model was statistically significant,  $R^2 (.142)$ ,  $F(3, 88) = 5.12$ ,  $p = .003$ . However, the interaction between the CAHPS scores and education was not statistically significant, ( $b = .022$ ,  $t(92) = .176$ ,  $p = .86$ ). These results indicate that education does not moderate the relationship between level of patients' satisfaction with their provider and their T2DM treatment adherence. Therefore, the null hypothesis cannot be rejected. Please see Figure 3 for a summary of these findings.



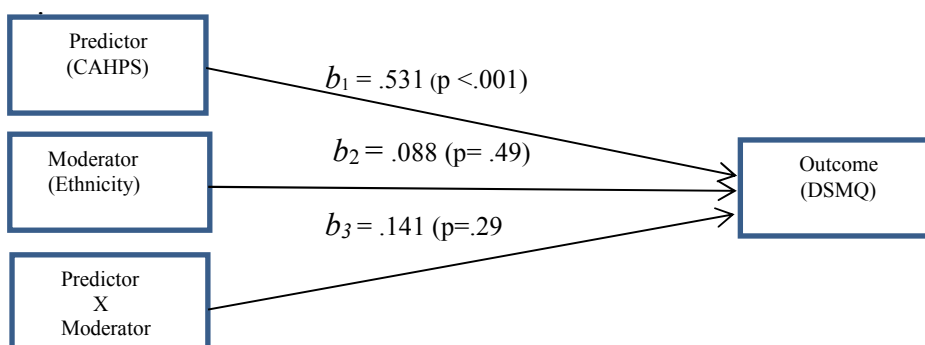
*Figure 3.* Model of physician-patient relationship and patient treatment adherence moderated by education.

#### **Alternative Hypothesis 4**

The fourth alternative hypothesis was that ethnicity would moderate the relationship between treatment adherence and the patient's scores on physician-patient satisfaction surveys for patients with T2DM

**Ethnicity.** To test the hypothesis that ethnicity moderates the relationship between the level of patients' satisfaction with their provider and their T2DM treatment adherence, a regression was conducted using PROCESS. The variable "ethnicity" was

entered as a continuous variable, the independent variable (CAHPS) scores were entered, and the dependent variable (DSMQ) scores were entered, using Model 1 in PROCESS. The overall model was statistically significant,  $R^2 (.155)$ ,  $F(3, 88) = 6.77$ ,  $p < .001$ . However, the interaction between the CAHPS scores and ethnicity was not statistically significant, ( $b = .141$ ,  $t(92) = .001$ ,  $p = .29$ ). These results indicate that ethnicity does not moderate the relationship between level of patients' satisfaction with their provider and their T2DM treatment adherence. Therefore, the null hypothesis cannot be rejected. Figure 4 depicts a summary of these findings.



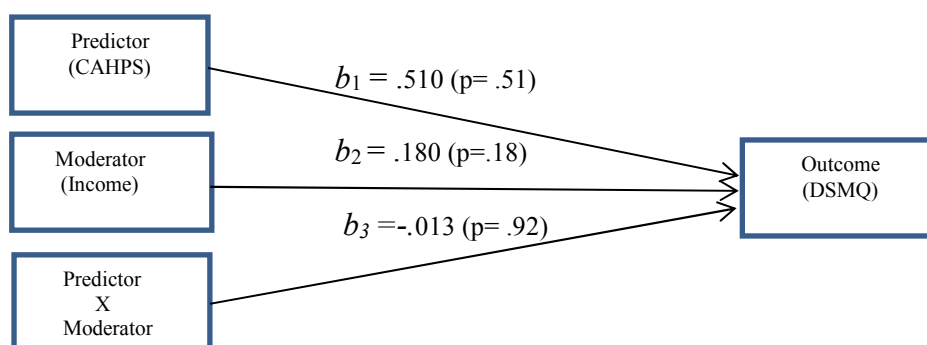
*Figure 4.* Model of physician-patient relationship and patient treatment adherence moderated by ethnicity

### Alternative Hypothesis 5

The fifth alternative hypothesis was that income would moderate the relationship between treatment adherence and the patient's scores on physician-patient satisfaction surveys for patients with T2DM

**Income.** To test the hypothesis that income moderates the relationship between the level of patients' satisfaction with their provider and their T2DM treatment adherence, a regression was conducted using PROCESS. The variable "income" was

entered as a continuous variable, the independent variable (CAHPS) scores were entered, and the dependent variable (DSMQ) scores were entered, using Model 1 in PROCESS. The overall model was statistically significant,  $R^2 (.152)$ ,  $F(3, 88) = 7.80$ ,  $p = .000$ . However, the interaction between the CAHPS scores and income was not statistically significant, ( $b = -.013$ ,  $t(92) = -.097$ ,  $p = .923$ ). These results suggest that income does not moderate the relationship between level of patients' satisfaction with their provider and their T2DM treatment adherence. Therefore, the null hypothesis cannot be rejected. Please see Figure 5 depicts a summary of these findings.



*Figure 5.* Model of physician-patient relationship and patient treatment adherence moderated by income.

### Additional Analyses

Examination of the data and the study findings suggested additional analyses. There were three variables from the CAHPS survey that were examined. The first variable was about the length of time that the patient had visited the provider, from six months or less, to five years or more. The second variable was the number of times that

the patient had seen the provider in the past year, from one time to 10 or more times. The third variable was gender.

A Pearson correlation two-tailed test of significance was conducted on each of the variables and the DSMQ. The results for length of time were statistically significant ( $r = .44, p = .04$ ). The result for the number of times was not statistically significant ( $r = .22, p = .27$ ). This suggests that number of visits is not correlated with patient's T2DM treatment adherence, but the length of time that the patient had been a patient of the physician is correlated with T2DM treatment adherence.

Gender, another variable from the CAHPS survey, was also examined to see if there was a moderating effect on treatment adherence. To test the hypothesis that gender moderates the relationship between the level of patients' satisfaction with their provider and their T2DM treatment adherence, a regression was conducted using Model 1 in PROCESS. The variable "gender" was entered as a categorical variable, the independent variable (CAHPS) scores were entered, and the dependent variable (DSMQ) scores were entered, using Model 1 in PROCESS. The overall model was statistically significant,  $R (.451), F(3, 88) = 6.83, p < .001$ . The interaction between the CAHPS scores and gender was also statistically significant, ( $b = -.608, t(92) = -2.26, p = .03$ ). These results suggest that gender does moderate the relationship between level of patients' satisfaction with their provider and their T2DM treatment adherence. A plot was generated from the results to evaluate gender, grouped by male and female. Evaluating the plot lines, males were more likely to report better treatment adherence as their CAHPS scores increased

versus females whose treatment adherence scores were not as affected as much by their CAHPS scores (see Figure 6).

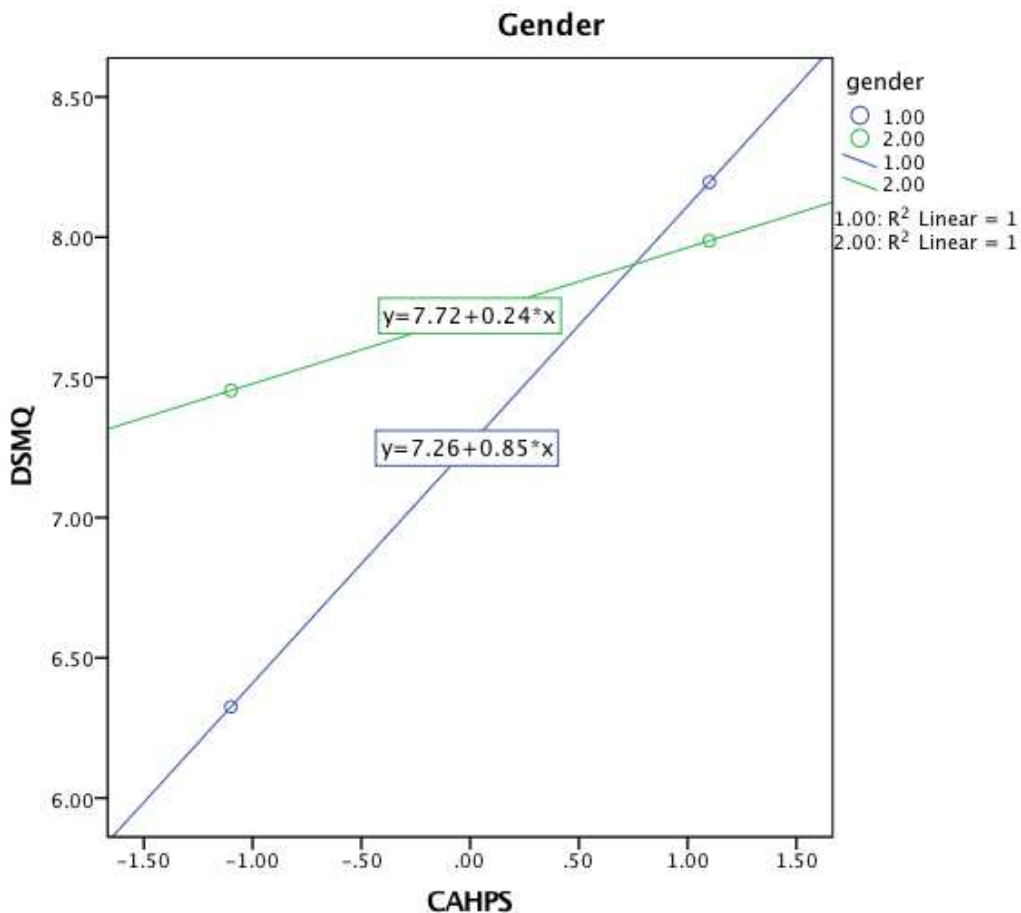


Figure 6. Interaction between the variable “gender” and the CAHPS and DSMQ scores. Note: 1= Male and 2 = Female.

### Summary

A Pearson correlation was performed on the two main variables of the DSMQ dependent variable and the CAHPS independent variable. The null hypothesis for research question one was rejected, as there was a significant correlation between the level of satisfaction with the physician-patient relationship and patient’s T2DM treatment

adherence. Two CAHPS composite score variables were also analyzed individually, along with the DSMQ variable using Pearson correlations. Significant correlations were found for both composite score variables.

Research questions 2-5 included the moderating effects of age, education, income, and race in the relationship between CAHPS and DSMQ. There were no significant interactions for any of the moderators; therefore, the null hypotheses were not rejected for age, education, ethnicity, or income.

Secondary exploratory analyses were conducted to see if the length of time that the subject had been a patient of the provider and number of times the patient was seen by the provider in the past year correlated with treatment adherence. The results show that only the length of the time that the subject had been a patient of the provider was statistically significant. Gender was also examined to see if it had a moderating effect on treatment adherence. The null hypothesis was rejected as gender had a moderating effect on the physician-patient relationship and patient's treatment adherence.

In Chapter 5, the present study is summarized, along with the purpose and the nature of the study. Key findings are described, interpreted, and compared to findings in the Chapter 2 literature review. Limitations, reliability, and validity of the study are discussed. Finally, recommendations for further research are discussed.



## Chapter 5: Discussion

### **Introduction**

Diabetes is a growing and costly chronic disease. Despite improvements in medications, technology, and other adherence methods, adherence for T2DM still hovers around 50% (García-Pérez et al., 2013). Diet and exercise are also recommended as part of T2DM management, but patients do not always follow these recommendations (García-Pérez et al., 2013), even though diet, exercise, and medication adherence improve T2DM outcomes (Vasilescu, 2015). The ADA recommended individualizing treatment for patients by using shared-decision making between the physician and patient and also understanding the patient's background (Romeo & Abrahamson, 2015). While there are provider, patient, and system factors that affect patient adherence, this study was designed to focus on provider factors.

The purpose of this quantitative correlational study was to investigate the physician-patient relationship and T2DM treatment adherence. Also evaluated were moderator variables of age, education, ethnicity, and income. These were included to see if these variables moderated the relationship between the physician-patient relationship and treatment adherence. Secondary analyses were also conducted on two composite scores from the CAHPS survey (provider communication and politeness), length of time the participant had been a patient of the physician, how many times the participant had seen the physician in the previous 12 months, and gender. There were five research questions in this study. Research question one (RQ1) was used to determine if the patient level of satisfaction with the physician-patient relationship increased patient treatment

adherence. Research questions 2-5 examined if the variables of age, education, ethnicity, and income moderated this relationship. The results were significant for the RQ1. None of the moderator variables were significant for moderating the relationship, but a secondary analysis evaluating gender as a moderator was significant.

### **Interpretation of the Findings**

#### **Hypothesis 1**

Hypothesis 1 was supported by the data. Higher scores on the CAHPS survey were correlated with better patient treatment adherence. This is in line with other studies that have been conducted to evaluate the physician-patient relationship, physician-patient engagement, and shared-decision making. The findings show that better communication, shared-decision making, and physician engagement leads to better patient treatment adherence.

Many of the studies that were designed to evaluate the physician-patient relationship incorporate only one aspect of the relationship, for example trust. This current study included questions that captured many different elements of the physician-patient relationship. These included questions about trust, respect, listening, feeling respected, understanding what was being communicated by the physician, education about the patient's diabetes, whether the physician interrupted or ignored the patient, and concern and caring for the patient.

Communication needs to go both ways. The patient cannot just answer questions asked by the physician; the patient needs to participate, ask questions, and let the physician know about any concerns. Learning about the patient as an individual allows

the physician to have a better understanding of the patient in a more holistic way and reduces physician stereotyping or judging of the patient. Bundesmann and Kaplowitz (2011) found that effective physician communication about diabetes treatment led to better patient self-care. Ratanawongsa et al. (2013) reported that higher scores on a patient survey on provider communication led to higher medication adherence for patients who were dispensed diabetes, antihypertensive, or lipid lowering medications, while lower provider scores were equated with lower medication adherence. More engaged patients have better health outcomes, including those with diabetes (Simmons, et al., 2014). Polonsky et al. (2017) found that physicians who were collaborative and encouraging reported that this might lead to better patient T2DM self-management and treatment adherence. When the health beliefs of the physician and the patient are in alignment, improved medication adherence is seen (Christensen et al., 2010). The opposite holds true too. When there is a lack of clear communication, medication adherence can decrease, especially when the physician gives only basic information to the patient, while the patient desires more comprehensive education about their disease and how to manage it properly (Lapane, Dube, Schneider, & Quilliam, 2007). Other factors that can decrease medication adherence include the physician focusing on the biomedical aspects of the disease instead of the sociodemographic factors that the patient may be facing and lack of information about his or her medication regimens (Schoenthaler, Knafl, Fiscella, & Ogedegbe, 2017). Patients find less value in medication reminders like texts and more value in receiving education about dosing and side effects (Cascade et al., 2010).

The CAHPS survey used in the present study includes two composite score subscales, one on how well the provider communicated and one on how respectful the provider was with the patient. Analyses using Pearson correlation two-tailed test of significance were conducted ( $\alpha = .05$ ) on these two composite score subscales. Both were also statistically significant for treatment adherence. Two other variables from the CAHPS were evaluated. One was the length of time that the participant had been a patient of the physician and number of times that the patient had seen the provider in the past 12 months. The length of the relationship was significantly correlated with treatment adherence. Increased time, meaning how long the participant had been a patient of the physician, was correlated with better treatment adherence. In Cotugno et al.'s (2015) study, patients reported that they highly valued a productive and continued relationship with their healthcare provider. This continuity of care was important to these patients.

A longer established relationship with the physician can be interpreted as both the physician and patient working well with each other. As for number of times the patient saw the physician not being a significant finding, this was difficult to predict. If a patient was seeing his or her physician more frequently, it may have been because of a lack of treatment adherence or better treatment adherence. For example, the patient may have a more complicated case of T2DM requiring diet, exercise, and medication requiring more interaction with his or her physician. The patient might also have trouble controlling his or her T2DM, which made it necessary to see his or her physician more to gain better control over their disease. Likewise, a patient may have been seen less frequently either because he or she was being better managed or because the patient was not keeping

appointments. In the current study, some of the patients were not on medications and were not required to measure their blood glucose levels. The National Institute for Health and Care Excellence's (2018) guidance study on Type 2 diabetes in adults reported that self-monitoring of glucose is not recommended unless the patient is on insulin, has had hypoglycemic episodes, is on oral medications that could increase his or her risk while driving or operating equipment, or is pregnant or considering becoming pregnant. (National institute for Health and Care Excellence, 2018).

If their disease was easily managed, the patients would not have to see their physician as frequently. However, some of the patients may have skipped appointments, even though their diabetes was not being well controlled. Also, another factor is that other clinic staff may have helped the patients manage their diabetes treatment. For example, the patient may have been seeing an advanced practitioner, such as a nurse with more specialized training instead of the physician for certain appointments during the previous year. This would have skewed the results also. In summary, it is hard to determine why exactly a patient would have seen his or her physician more or less times during the previous year.

The significance of the physician-patient relationship cannot be underestimated. This relationship is the foundation for what happens next for patient treatment adherence and it starts with a conversation. Patients who feel heard and trust their physicians are more likely to discuss barriers to their treatment adherence. It is during this conversation that the physicians are able to truly understand what potential challenges the patients may face when managing their diabetes. This allows the physicians to tailor the treatment

plan to their patients and include the patients in their treatment decisions, thereby empowering the patient to self-manage. Even the ADA recommends an individualized treatment approach for patients diagnosed with diabetes, including shared decision-making. This includes an understanding by the physician on the patient's cultural background, comorbidities, preferences, and likelihood of medication adherence (Romeo, & Abrahamson, 2015), along with viewing the patient through a biopsychosocial lens, instead of the strictly biomedical model. It is important to listen to the patient and his or her self-reported information as opposed to standardized treatment (Schunk, Stark, Reitmeir, Meisinger, & Holle, 2015).

### **Hypotheses 2-5**

Hypotheses 2-5 were included to address whether the moderator variables of age, education, ethnicity, and income individually acted as moderators between the physician-patient relationship and the patient's treatment adherence. None of these moderators were found to be significant for moderating this relationship. However, a secondary analysis using gender as a moderator between the physician-patient relationship and patient treatment adherence was statistically significant.

**Age.** The second hypothesis, age was not found to be a significant moderator of the physician-patient relationship and patient treatment adherence. There is limited information on how age modifies the relationship between the physician-patient relationship and treatment adherence. One study by Peck (2011) had results that older patients had better patient-centered encounters, but another study by Smith (2013) had different results, as in patients aged to >65 this trend reversed. However, Peck (2011)

gathered data from a geriatric clinic, while Smith (2013) gathered data from a national survey that included a subset of communities. Younger patients may view the physician as an authority figure. All age groups were well represented in this current study.

**Education.** The third hypothesis, education was not found to be a significant moderator of the physician-patient relationship and patient treatment adherence. This is in contrast to what has been reported in other studies. Higher education has been associated with better quality diets (Darmon & Drewnowski, 2008; Kell et al., 2015), and found more likely to relate to exercise (Morrato et al., 2007). One aspect of education is health literacy, which can also moderate this relationship. Approximately one-third of patients are thought to have basic or low health literacy (Weiss, 2015). Patients with low health literacy may not feel comfortable asking questions of their providers (Verlinde et al., 2012), and they may not be adherent to their medication because they do not understand T2DM and the importance of adherence (Koprulu et al., 2014). One reason why the moderator for education was not significant may be the participant population. The participants in this current study were more educated than average with almost 97% having two years of college or more, while only 2.2% had only a high school education.

**Ethnicity.** The fourth hypothesis, ethnicity was not found to be a significant moderator of the physician-patient relationship and patient treatment adherence. The patient population in this study was not racially or ethnically diverse. Approximately 80% identified as White. A more diverse population may have resulted in ethnicity being a significant moderator. However, other studies have different results. Ethnicity has been found to moderate the physician-patient and treatment adherence. Physicians may

approach all patients the same way despite the patient's cultural background (Mott-Coles, 2014). Stereotyping of patients also occurs leading to miscommunication and less ideal health outcomes (King et al., 2008). Johnson, Roter, Powe, and Cooper (2004) found that physicians communicated less with African American patients and dominated the conversations more than with White patients. Treatment adherence stratified by race is not well researched (Peeters et al., 2011). Patients from different ethnic backgrounds may have difficulty switching their diets toward food choices that do not match their customary, culturally specific one (Cheng et al., 2016) and may not understand what healthy food choices are versus, what they are not (Carr, 2012). Food insecurity can also affect diet even if the patient wants to eat healthy (Strings et al., 2016). Diet recommendations are often not tailored to the ethnic background of the patient.

**Income.** The fifth hypothesis, income was not found to be a significant moderator of the physician-patient relationship and patient treatment adherence. This differs from other studies where results show that physicians can act differently towards patients with lower-income levels by not spending enough time with them or not explaining things so that the patient is able to understand the information. Physicians are also less likely to participate in shared decision-making with patients from lower SES backgrounds (Verlinde et al., 2012). Trust can also be affected. Patients who feel more socially distant may lack trust in their physicians, and the physicians may not trust that the patient will adhere to medication regimens. Poverty can cause individuals to not seek medical care and be treated negatively by the physician (Loignon et al., 2010). Culture can also affect whether patients seek out treatment or not. For example, Henderson



(2010) discussed that a cultural belief held by some of the Indian elders was that care for diabetes symptoms should only be sought when symptoms became serious, due to a distrust of the White medical establishment.

Income can affect where a patient resides, the safety of his or her neighborhood, and even the patient's medication beliefs (Billimek & August, 2014). The nonsignificant results from this study are surprising since different income levels in this study were well represented. In spite of this, Billimek and August (2014) reported that education, gender, ethnicity, and SES factors did not have an impact on physician communication and patient self-care behaviors for patients diagnosed with T2DM.

### **Interpretation of Results Guided by Theories**

Guiding the direction of this study were the biopsychosocial (BPS) model and the self-efficacy theory. BPS relates to how treatment adherence is not just based on the medical aspect of diabetes treatment. Psychological and social factors also impact disease. For example, a patient may want to exercise to manage his or her diabetes but live in an area where he or she feels unsafe walking around. If the physician is not aware of this issue, he or she may feel that the patient is choosing not to listen to his or her recommendations, which may affect the physician-patient relationship. The psychological aspect of the BPS is also an important part of treatment adherence. Patient's beliefs about their diabetes can also impact treatment adherence. The patient may not be motivated to manage his or her diabetes or feel stressed about it. Psychological factors need to also be considered when managing a patient with T2DM.

Trust in the physician helps reduce emotional distress for the patient and this leads to better self-care activities by the patient (Niazi & Rafique, 2017).

It is important that the physician build a “working alliance” with the patient. Due to managed care, physicians now have less time with patients. Building a working alliance does not mean spending more time with the patient, rather it is important to improve the quality of the visit. A working alliance incorporates shared-decision making and goal setting, therefore, it is also important for the physician to understand that without the cooperation of the patient, the physician will be unable to improve the patient’s outcomes (Fuertes, Toporovsky, Reyes, & Osborne, 2017). This is much more reflective of the BPS than the medical model.

Montori (2017) discussed the burden of treatment for patients. Patients have to manage their treatment, whether it is coordinating their own care and appointments, or managing their disease, while still juggling other life tasks. Patients may feel that they cannot manage their disease and life in general leading to a shortfall where patients are nonadherent. This can cause both the patient and the physician to feel frustrated.

Another aspect of diabetes treatment management is related to the theory of self-efficacy. Unlike the BPS theory, which is used to address the factors that affect the patient’s health, the theory of self-efficacy involves the patient and how he or she learns to control his or her diabetes (Lorig & Holman, 2003). Self-efficacy comes from four sources: individual accomplishment, verbal persuasion, physiological state, and vicarious experience through others (Bandura, 1977). Chronic disease is unlike acute disease in that chronic disease is ongoing and often a permanent part of the patient’s life. Disease

self-management involves managing the disease, living a meaningful life while coping with the chronic disease, and emotionally adjusting to the disease. Part of managing chronic disease, along with medical knowledge, is helping the patient connect with other patients so that these other patients can share their patient knowledge about effectively managing their disease.

Three assumptions of peer-led chronic disease workshops are that the tasks and management of the chronic disease are similar, people can learn how to manage their disease more effectively, and this can lead to better health outcomes (Lorig, Ritter, Ory, & Whitelaw, 2013). In this current study, patients were not asked if they were a part of any support group to help manage their T2DM, although they were asked if there were other individuals in the physician's office that helped them manage their T2DM.

In summary, these findings add to the growing body of literature that effective management of T2DM requires a good working alliance between the physician and patient that is based on shared-decision making, respect and trust. It also requires treating the patient in a holistic manner, taking into account the psychosocial factors that can impact the patient when trying to manage his or her T2DM.

### **Limitations of the Study**

There were some limitations in this study. A larger sample size may have resulted in different results for the moderators, which typically require a large sample size for power. However, even with the current study sample size, an effect size of .14 was calculated for the analyses, which is considered a medium effect size (Cohen, 1992). Another limitation is that it was correlational in design and while it cannot be determined

if a good relationship with one's healthcare provider causes a change in patient treatment adherence, quality of the patient relationship with his or her provider did predict patient treatment adherence. Other staff in the office that assisted the patient in managing the disease may also have had an impact on the study results, since only three of the patients reported that no one else in the office helped them manage their disease.

A further limitation is that a significant proportion (80%) of the participants were White and with relatively high levels of education; therefore, these results cannot be generalized to other races or educational levels. A requirement that the participants be fluent in English limited the participant sample, thus these findings cannot be generalized to individuals that are not fluent in English. The sample population in this study does not mirror the general population. There are non-English-speaking patients in the United States who have been diagnosed with T2DM and this language barrier may contribute to the kind of relationship that the patient has with the physician. Communication may also be difficult between the physician and patient. Also, the majority of participants in this study had a high school education or higher, many with two years of college or more. These participants are less likely to have been challenged by low health literacy. Patients with low health literacy are estimated to comprise about one-third of the population (Weiss, 2015). This can make it difficult for the patient to understand his or her disease and why he or she needs to be adherent (HHS, 2008).

Additionally, the participants that filled out paper surveys were a smaller percentage of the overall sample population and these participants were from two clinics,

one in Louisiana and one in Texas. Therefore, these results cannot be generalized to other clinics or other parts of the country.

This was also a self-report study and therefore the researcher could not verify if the participants were answering truthfully. This study was also limited because the participants were asked only about the previous 12 months of experience with their provider, which would not capture their relationship changes over a longer period of time. Finally, another limitation with asking about the previous 12 months might be problems with retrospective recall.

### **Recommendations**

One recommendation would be to conduct this study with a larger sample of participants. The minimum number calculated was (n=92), and this was the number of participants in this study. A larger number of participants that are more ethnically diverse may lead to more confidence with the moderation analyses. Another recommendation would be to conduct a qualitative study using the same patient criteria used for this quantitative study. It would be useful to interview patients being treated for T2DM to find out what factors in the physician-patient relationship the patient views as impacting his or her treatment adherence. There may be other factors or factors that carry more weight in the treatment adherence.

A final recommendation would be to add more psychosocial variables to the survey. For example, rather than asking just about exercise there could also be questions about barriers for the patient to exercise. Recommending that a patient exercise, but not asking if there is a safe place for them to exercise is not helpful, because the physician

will not know whether the patient is choosing not to exercise, or instead lacks a safe place to exercise. Another example is having the provider set up text message notifications for the patient to take his or her medications, which may not be helpful and may be at cross purposes if the patient cannot afford the medications and is afraid to let the physician know that he or she had not even filled their prescription. However, good communications between the physician and patient may help the physician better understand any barriers that the patient might be facing, thereby leading to more workable solutions that help the patient better manage his or her disease.

### **Implications**

Current treatments for diabetes are not entirely successful. About half of patients are not adherent to their treatment plan. This places financial burdens on the patient, the healthcare system, and society as a whole. The physician-patient relationship has been shown to affect patient treatment adherence.

The results for the main research question in this study were statistically significant. Higher satisfaction with the physician-patient relationship was correlated with better patient treatment adherence in patients being treated for T2DM. Patients who are engaged in their treatments are actively involved and understand what is needed to correctly manage their disease (Simmons, Wolever, Bechard, & Snyderman, 2014). This is important because the incidence of diabetes and the healthcare costs associated with treating it and the other complications that can result from non-adherence continue to rise, along with obesity and an aging population. When physicians fail to understand the patients through a biopsychosocial lens, incorporating cultural and socioeconomic

background, they can miss barriers that impede patient treatment adherence. This can lead to frustration for both the patient and physician. Understanding the “whole” patient may lead to better patient treatment adherence, better patient quality of life, less diabetes complications and reduced healthcare costs.

The lack of statistical significance for the moderators may indicate that the focus should be more on the physician-patient relationship. Montori (2017) discussed how patient conversations could help to solve the problems that patients bring in to these meetings. Additionally, this can lead to better health policies targeted to the true health requirements of the communities and inclusiveness for all patients.

It is not enough to diagnose a patient with T2DM and then give him or her a treatment plan. The provider needs to delve further into the patient’s background, and current lifestyle behaviors, to view the patient through a biopsychosocial lens in order to ensure the best outcome. Montori (2017) discussed this approach for a patient named Maria Luisa who was the grandmother of one of his students. Maria Luisa was from Peru, had chronic health conditions, necessitating a complicated pill regimen, underwent dialysis three mornings a week and was afraid of falling down the stairs in the house that she lived with her son and two daughters. She was exhausted from her morning dialysis regimen, so she stopped doing her hobby, which was crocheting. The student, Ana, knowing the roadblocks to her grandmother’s health made some changes, by having an elevator installed, providing a compartmentalized pill box, changing the dialysis to the afternoons, and requesting Peruvian food recipes from a dietician in Peru (Montori, 2017). This biopsychosocial approach led to a more positive outcome. Maria Luisa now

enjoyed eating, started crocheting again, increased her social circle, moved with ease between floors in her house, and was compliant with her medications. This all eased her burden of treatment, helped her to feel better physically, and helped her to feel empowered and a participating member in her treatment (Montori, 2017).

### **Conclusion**

This current research was conducted using a sample of participants who could read and write English, were 18 years-of-age or older, and were being treated for T2DM for at least one year. Online surveys were offered to some participants. Paper-and-pencil surveys were also offered to participants who were patients of two clinics, one in Louisiana and one in Texas. The physician-patient relationship and potential correlation with patient treatment adherence were analyzed. The moderators of age, education, ethnicity, and income were examined to see if they moderated the physician-patient relationship and patient treatment adherence. Additional secondary analyses were conducted on two of the composite scores from the physician-patient relationship survey, as well as, two other variables from the survey. Gender was also analyzed as a potential moderator of the predictor and outcome variables.

The data were analyzed using correlation and multiple regression. The results for the main hypothesis were statistically significant, but the hypotheses for the moderators of age, education, ethnicity, and income were not statistically significant. However, two composite scores from the CAHPS survey analyzed using PROCESS with gender analyzed as a moderator were found to be statistically significant. Two other variables from the CAHPS survey were also analyzed using correlations; the length of time the



patient was a patient of the physician was statistically significant, while numbers of visits to the physician in one year, was not. Recommendations include: increasing the number of study participants for a quantitative study, conducting a qualitative study to understand what physician factors that patients view as impacting their treatment adherence, and adding more psychosocial variables to the CAHPS survey

The results of this study add to the growing body of literature that supports the importance of the physician-patient relationships in improving T2DM patients' treatment adherence. This study finds that patients who are knowledgeable about their disease, engaged in his or her treatment, is involved in shared-decision making, and can have an honest conversation with their physician about his or her treatment and barriers to treatment are more likely to be more treatment adherent.

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## Appendix A: DSMQ Questionnaire

**Diabetes Self-Management Questionnaire (DSMQ)**

The following statements describe self-care activities related to your diabetes. Thinking about your self-care over the <b>last 8 weeks</b> , please specify the extent to which each statement applies to you.	applies to me very much	applies to me to a considerable degree	applies to me to some degree	does not apply to me
1. I check my blood sugar levels with care and attention. <input type="checkbox"/> Blood sugar measurement is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
2. The food I choose to eat makes it easy to achieve optimal blood sugar levels.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
3. I keep all doctors' appointments recommended for my diabetes treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
4. I take my diabetes medication (e. g. insulin, tablets) as prescribed. <input type="checkbox"/> Diabetes medication/insulin is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
5. Occasionally I eat lots of sweets or other foods rich in carbohydrates.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
6. I record my blood sugar levels regularly (or analyse the value chart with my blood glucose meter). <input type="checkbox"/> Blood sugar measurement is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
7. I tend to avoid diabetes-related doctors' appointments.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
8. I do regular physical activity to achieve optimal blood sugar levels.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
9. I strictly follow the dietary recommendations given by my doctor or diabetes specialist.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
10. I do not check my blood sugar levels frequently enough as would be required for achieving good blood glucose control. <input type="checkbox"/> Blood sugar measurement is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
11. I avoid physical activity, although it would improve my diabetes.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
12. I tend to forget to take or skip my diabetes medication (e. g. insulin, tablets). <input type="checkbox"/> Diabetes medication/insulin is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
13. Sometimes I have real 'food binges' (not triggered by hypoglycaemia).	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
14. Regarding my diabetes care, I should see my medical practitioner(s) more often.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
15. I tend to skip planned physical activity.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
16. My diabetes self-care is poor.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

## Appendix B: Dissertation Research Request

### **Facebook, Nextdoor, Texas Psychological Association and Walden Participant Pool**

My name is Cindy Schmidt. I am a doctoral student in Clinical Psychology at Walden University. I am conducting research to see if there is a significant relationship between treatment adherence and the patients' scores on physician-patient satisfaction surveys for patients (ages 18+) diagnosed with type 2 diabetes mellitus (T2DM). There are two self-report surveys. One includes questions about your provider and demographic information and the other survey includes questions about your diabetes management. The time to complete both surveys is about 15 minutes. To participate in this study you must be 18-years-of-age or older, having been diagnosed with T2DM for at least a year, and have seen your provider at least once in the past year for diabetes treatment. If you would like to participate, please click on the link, SurveyMonkey:  
<https://www.surveymonkey.com/r/G2WP65S>

<https://www.surveymonkey.com/r/M3LK9SB>