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Walden University

College of Health Sciences

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Cecilia S. Trinidad

has been found to be complete and satisfactory in all respects,
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Walden University

2020

Abstract

Effect of Health Literacy on Medication Adherence in Older Latina Women with
Type 2 Diabetes Mellitus

by

Cecilia S. Trinidad

MSN, University of the Incarnate Word, 2005

BSN, University of the Incarnate Word, 2002

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Nursing Education

Walden University

August 2020

Abstract

The level of health literacy (HL) can have a significant impact on an individual's ability to understand how to care for themselves. Limited HL reduces access to healthcare having limited HL is associated with poor self-management of Type 2 Diabetes Mellitus (T2DM), which is common among vulnerable populations and further contributes to increased morbidity and mortality, especially in which is true in Latina/Hispanic adults who have T2DM. The purpose of the study, guided by the health belief model, was to determine what effect an educational intervention had on blood glucose levels, health literacy, and medication adherence in older Latina/Hispanic women with T2DM.

Seventeen participants with T2DM met the inclusion criteria and completed 3 clinic visits over 3 weeks. Data were analyzed using repeated measures ANOVA. The results showed that the teaching session had no statistically significant effect on HL, blood glucose, and medication adherence. Further study is needed to identify additional variables which may be predictors, of adherence, such as financial need, instances of attending scheduled medical appointments, and participation in a structured diabetes education program. A structured program might include formal education classes on T2DM with classes provided both in English and Spanish and include the participation of men because gender can be a strong predictor of medication adherence among Latinos. Improving HL outcomes can help in improving overall health of individuals and communities, which effects positive social change.

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Dedication

This dissertation is dedicated to my husband, Jesus M. Trinidad, Jr., who encouraged and supported me to help make this goal a reality.

The other individuals I wish to thank are my sisters, Gilda S. Shaw, who helped edit and proofread this dissertation, and Linda S. Sanchez, who was always there to encourage and offer support every step of the way.

To my parents Tony and Rosie Sifuentes, who always believed that education was the key to success and taught me to always strive to do my best no matter how difficult the climb.

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To the remainder of my family, who let me slide when family occasions were taking place so that I could focus on this study. To my friends, who also provided support and encouragement, and on occasion, when I got to serious made sure that I took time to enjoy life.

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Chapter 1: Introduction to the Study

Introduction

The World Health Organization (WHO) has defined health literacy (HL) as the “cognitive and social skills which determine the motivation and the ability of individuals to gain access to, understand and use information in ways which promote and maintain good health” (Souza et al. 2014, p.1). An individual’s level of HL can have a significant impact on his or her ability to understand how to care for themselves. Limited HL reduces access to healthcare and further contributes to increased morbidity and mortality. HL is not only about the ability to read or understand facts; it is about the ability to find the appropriate care to take care of oneself. In 2003, the objective of the U.S. Department of Health and Human Service’s (DHHS) action plan *Healthy People 2010* objectives highlighted the complex HL phenomenon involving participants, providers, and organizations (McCormack, Thomas, Lewis & Rudd, 2017; U.S. DHHS, 2010). Today individuals continue to struggle with issues related to HL. In further reviewing the *Healthy People 2020* goals and objectives, HL is found under the topic of health communication and health information technology. Goals related to the improvement of HL show minimal improvement, and work continues on methodologies that can help providers to enhance instructions on how participants should care for themselves through the advancement of communication (DHHS, 2019).

Multiple studies, dating back to the early 1990s, have demonstrated the correlation between literacy and the ability to function not only within society but also in the healthcare setting (Carollo, 2015). Participants with low HL contribute to increases in

health care expenditures through less frequent use of preventive health services, poorly managed chronic illness, and regular use of emergency department services (Carollo, 2015). Individuals aged 55 and older have the smallest percentage of people with proficient HL skills and thus should be assessed for HL skills (Findley, 2015).

In Chapter 1, I explain the plan and design for my research study. Major sections of Chapter 1 include the background, problem statement, purpose, and research questions and hypothesis and theoretical framework. I describe the nature of the study definitions of my study variables, assumptions, scope, delimitations, and limitations. I conclude the significance of the study and summarize the contribution the study makes to the advancement of nursing practice and positive social change.

Background

The risk of developing T2DM is approximately two times higher for Latina adults than for non-Latina whites. Genetics, environmental and cultural factors are known contributors to the development of T2DM (Caballero, 2011; Centers for Disease Control and Prevention [CDC], 2011). Latina women born in 2000 have a 52.5% risk, of developing diabetes in their lifetime, which far exceeds the 31.2% risk for non-Latina white females (CDC, 2011; Ivanov, Wallace, Hernández, & Hyde, 2015;). Glycemic control is strongly linked to better outcomes in adults with T2DM precisely through the reduction of complications (Whittemore, 2007). Research suggests that having limited HL is associated with poor self-management of T2DM, which is common among vulnerable populations, including minorities and the elderly (Moss, 2014). Current research suggests that improving participants' HL is a practical education and prevention

tool to promote disease management behaviors, including balancing medication adherence (Miller, 2016). Low HL has been connected to a higher risk of death and an increased number of emergency room visits and hospitalizations (AHRQ, 2011; Ivano, et al, 2015)

Low HL is a stronger predictor of health outcomes than social and economic status, education, gender, and age (Lee, Yu, You, & Son, 2015). However, less is known about older women over 55 years, in particular, Latina women who are one of the largest groups of women at risk due to living in poverty, their low literacy rate and chronic health conditions (Torres, 2014). Low HL is a burden to individuals and society, with global implications affecting the most vulnerable (Carollo, 2015). The research study by Ivanov et al. (2015) validates that a gap related to HL and medication adherence does exist among older women with diabetes.

My study is unique because it will produce data on the under-researched area in Latina women over 55 years of age who have T2DM and receive HL skills (Ivano et al., 2015). Women of Latina heritage have a genetic predisposition for the development of diabetes and a 32.6% chance of being diagnosed with diabetes between the ages of 65-74 years of age when compared to 18.4% of non-Latina White women (CDC, 2012; Ivano et al., 2015). Undertaking this research could lead to a positive social change to develop culturally targeted health interventions. By providing best practices for chronic illnesses such as T2DM, health practitioners can meet the cultural health needs of this population and enhance their lifestyles.

Problem Statement

The problem addressed in this study is how HL is tied to the ability to help make the necessary decisions related to health outcomes, which affect functional health status. Without this understanding, an individual's health cannot improve (Lee et al., 2015). The impact of low HL is notable in older adults, over the age of 65, with the most significant decline in HL seen at about 55 years of age, due to polypharmacy and chronicity of illness (Carollo, 2015; Manafo & Wong, 2012). Studies have shown that individuals with limited HL are more often nonadherent with the medical advice given to them by their healthcare providers (Duggan et al., 2014; Fleischer, Henderson, Wu, Liese & McLain, 2016; Lopez & Golden, 2014). Among older adults, the older women are at the highest risk of non-compliance with their health care treatment due to their low HL (Cornett, 2009).

Factors that place Latina women at high risk of low HL are lack of education, poverty, and language barriers. Consequently, factors that contribute to the lack of medication adherence in Latina women with T2DM may be related to limited income, not following the instructions provided by the healthcare provider, inability to read a prescription label or failure to do glucose testing because they do not comprehend how to operate the equipment or know what the results mean. There is a limited amount of information known about adults over age 65, especially Latina women (Torres, 2014). Findings from a meta-analysis validated the importance of HL and the efficacy of HL interventions, especially among more vulnerable patient groups such as the older Latina woman (Miller, 2016). Older Latina women have documented HL problems and which

are inadequate to manage their health care needs (Findley, 2015). Older women with low HL are at risk for many potentially adverse health outcomes, which include poor medication adherence, less knowledge about their health outcomes, and complications (Findley, 2015).

Prevention and self-management are crucial issues that are dependent upon patient involvement and interaction with the healthcare provider. Results from a study conducted by Duggan et al. (2015) revealed that Latinos are less likely than other groups to access regular health care sources, such as hospital emergency departments or public health clinics, and to experience cultural and economic barriers to care, including the inability to speak English and low rates of health insurance coverage. Latinos, especially women, tend to overlook their health, and often they are expected to place family needs ahead of themselves, which may also interfere with their self-care practices, which affect how they manage with their diabetes (Lemly & Spies, 2015). As a result, it is vital to study older Latina women and the relation to diabetes risks and how to develop and implement educational opportunities to help improve the quality of life and minimize the risk of complications of T2DM in individuals with low HL. The exclusion of older, and especially older Latina women from participating in most traditional randomized controlled trials related to diabetes interventions have left gaps in knowledge on how to best address diabetes in the age-group who has the highest prevalence rates when it comes to the management of diabetes (Kirkman et al., 2012).

Purpose of the Study

The purpose of the study was to determine what effect an educational intervention had on blood glucose levels, health literacy, and medication adherence in older Latina/Hispanic women with T2DM. I conducted a quasi-experimental quantitative, repeated measures design. The independent variable was an educational intervention provided to women who participated in the study over 3 weeks. The educational intervention will cover topics that affect T2DM.

Research Questions

The research question for my study is:

Research Question 1: What effect does an educational intervention have on blood glucose levels, health literacy, and medication adherence in older Latina/Hispanic women with T2DM?

H_{o1}: There will be no effect on blood glucose levels, health literacy, and medication adherence in older Latina/Hispanic women with low literacy T2DM after experiencing an educational intervention.

H_{a1}: There will be an effect on blood glucose, health literacy, and medication adherence in older Latina/Hispanic women with T2DM after experiencing an educational intervention.

The planned independent variable was an *educational intervention* that was planned to be provided to all women participating in the study over 3 weeks. The educational intervention covered topics dealing with taking daily medication, glucose monitoring, sick day rules, diet, and exercise to help with the management of diabetes.

The dependent variables to be assessed were glucose levels and HL. The *Brief Medication Questionnaire (BMQI)*; see Appendix B and C) developed by Svarstad, Chewning, Sleath, and Claesson (1999) was used to measure the participant's self-reported level of medication adherence. HL will be assessed by using the *Short Assessment of HL –and English (SAHL-S&E, 2016; see Appendix D)* and the *Short Assessment of HL – Spanish (SAHL-S&E, 2016; see Appendix E)* by the Agency for Healthcare Research and Quality (AHRQ) to determine the participant's literacy level. I used the initial baseline glucose level at the beginning of the study to assess blood glucose compliance. *The Michigan Brief Diabetes Knowledge Test (BDK; see Appendix F and G)* developed by Fitzgerald et al. (2016) was used to evaluate general diabetes at three different points during the research to determine knowledge and self-care which has 14 items that focus on (a) the diabetes diet; (b) foods high in carbohydrates; (c) what the best methods for testing glucose is; (d) the frequency that glucose levels should be measured; and (e) what foods that can help lower the risk of heart disease. These items are helpful to address when teaching participants with T2DM (see Appendix F and G).

Theoretical Foundation

The theoretical foundation that I used to guide my study was the health belief model (HBM). This model was developed in the early 1950s by social scientists at the U.S. Public Health service to understand the failure of people to adopt disease prevention strategies to help with their disease process (McEwen & Wills 2014). The model posits that health-seeking behavior is influenced by a person's perception of a threat which is posed by a health problem and that the value associated is when actions are used to

reduce the danger (Polit & Beck, 2018). There are several major components of the HBM, which include perceived susceptibility, perceived severity, perceived benefits and costs, motivation, and enabling or modifying factors (Snowdon-Carr 2016). The model also contends that cues to action are what motivate the process of decision making for those considering care (Garcia, 2016). The HBM has been used in the identification of medication adherence, comorbid illness presence, and perceived barriers related to medication adherence. Based on a review of the literature, the HBM one of the most widely used theories guiding research for a variety of health concerns and populations, including work with Latina women (Garcia, 2016). The HBM is described in greater detail in Chapter 2.

Nature of Study

According to Creswell (2014), a quasi-experimental design is used to establish relationships between the variables. In this type of study, the independent variable is identified but not manipulated, and the effects of the independent variable are measured (Creswell, 2014). The study design was a one-group repeated measures design with an educational intervention. I collected data at three points in time. I recruited a convenience sample composed of Latina women, 55 years and over, who attended a community health clinic regularly or a physician's office and received care for their T2DM. The goal was to determine if an educational session affects blood glucose levels, medication adherence, and HL levels, which can help control T2DM. Once research participants were recruited, and informed consent signed, the participants were informed that they could choose to withdraw from the study at any time should they decide to do so. Study participants were

given tests to evaluate their literacy level using the *Short Assess of HL – Spanish and English*; see Appendices D and E) developed by the Agency for Healthcare Research and Quality (AHRQ). The *Brief Medication Questionnaire (BMQ)*; see Appendix B and C) will be used to measure the participant's self-reported level of medication adherence and to determine how well the patient can control glucose levels through medication adherence (Svarstad, Chewing, Sleath, & Claesson, 1999). *The Michigan Brief Diabetes Knowledge Test*; see Appendix F and G) developed by Fitzgerald et al. (2016) was used to evaluate general diabetes knowledge and self-care. This test consisted of a 14 item test questions focusing on (a) the diabetes diet; (b) foods high in carbohydrates; (c) what the best method for testing glucose is; (d) HbA1C should be measured how frequently; (e) what foods can help lower the risk of heart disease are examples of this test that can be helpful when teaching participants with T2DM (Appendix F and G).

Along with these three tools of measurements, participants were asked to sign a consent for release of records to obtain lab reports showing their glucose level and HbA1c levels before the educational intervention was to be provided. The educational intervention stressed the importance of taking daily medication, glucose monitoring, sick day rules, diet, and exercise over a 3-week timeframe. The outline used was reviewed with a certified diabetes educator who assisted and helped with its validation. When the participant has completed the educational intervention, they completed a posttest to determine if the HL, and medication adherence scores and diabetes knowledge improved. Participants were tested at 7-day intervals regarding their HL, medication adherence, and knowledge related to diabetes.

Definitions of Terms

Adherence: is the active, voluntary, and collaborative involvement of a patient in a mutually acceptable course of behavior to produce a therapeutic result (Brown & Bussell, 2011).

Blood glucose level: is the amount of glucose in the blood (American Diabetes Association [ADA], 2018).

Type 2 Diabetes (T2DM): is a group of clinically heterogeneous disorders that have glucose (blood sugar) intolerance in common. It encompasses many causally unrelated diseases and includes many different etiologies of disturbed glucose tolerance. The term T2DM is utilized to describe a syndrome characterized by chronic hyperglycemia (i.e., an excess of glucose in the bloodstream) and other disturbances of carbohydrate, fat and protein metabolism (McCance et al., 2010).

Health Literacy: is the capacity to obtain, communicate, process, and understand necessary health information that influences self-management behaviors and individual outcomes (Shiyanbola et al., 2017).

Latina: is a woman or girl of Mexican or Latino origin living in the United States (Hispanic Economics, n.d.).

Medication Adherence: is the active, voluntary and collaborative participation of a patient in the course of mutually acceptable behavior to produce a therapeutic outcome. (Brown & Bussell, 2011).

Assumptions

An assumption for this study was that older Latina women with T2DM desired to take their medication correctly and control their blood glucose levels. A second assumption was that the older Latina had the desire to communicate effectively with their health care provider to comprehend the importance of adherence when taking their medications to reduce complications associated with the treatment of diabetes. The third assumption was that older Latina women who participated in this study provided complete and accurate responses to the survey questions based on the data-gathering instruments used in the study to correctly measure HL and medication adherence. In utilizing the HBM as the theoretical framework for my research, it helped to posit that health-seeking behavior is influenced by a person's perception of a threat which is posed by a health problem and that the value associated is when actions are used to reduce the danger (Polit & Beck, 2018).

Scope and Delimitations

My study included older Latina women, ages 55 and older, with T2DM who lived in Central Texas. I determined if an educational intervention effects medication adherence, T2DM, and HL in older Latina women. This study did not include other older Latina women who might reside elsewhere in Texas or other states. The Latina women participating in this study spoke either Spanish or English. As the researcher, I am fluent in both Spanish and English and could interpret for participants when needed. Individuals who are not of Latina heritage or speak another language other than Spanish and English and are less than 55 years of age were excluded from the study. I did not

include participants who are dependent on insulin due to the need for tighter control target values, which were affected by diet, medication, macro, and microcirculation (ADA, 2018). Once I had determined the participant's glucose level, HL, and self-reported medication adherence each participant was invited to attend the educational intervention. I planned to provide an educational intervention covering the use of glucose monitoring for daily testing of glucose levels and an interpretation of the results. Another part of the educational intervention addressed the importance of medication adherence to control blood sugar levels. The educational intervention was completed in a two-hour seminar.

Initially, I planned to use the HL Skills framework developed by Squiers, et al. (2012) but opted to switch to the HBM because my focus was on changes in health behaviors related to the importance of medication adherence and HL. The HBM model has been used in various studies dealing with Latino health-related issues, such as this study's focus (see Garcia, 2016). I planned to lower the age for study participants to 50 years of age; however, this changed when I found that fewer research studies had been done on the older Latina woman over 55 years of age. The study had limitations of generalizability due to the design and convenience sampling, but this will be covered in more detail in the limitations section.

Limitations

Limitations are restrictions or problems in a study that may decrease the generalizability of findings. All studies have limitations that occur in research, which can be attributed to the design or methodology selected, which can impact or influence the

application or interpretation of the results of the study. One limitation of my quasi-experimental design was a lack of randomization (Polit & Beck, 2018). I used convenience sampling, which limits the generalizability of the findings. Lastly, time constraints could occur when attempting to obtain information from the participants due to the lack of HL, or their ability to read instructions given to them when trying to administer questionnaires that relate to the test instruments that will be used to measure their lack of knowledge or show improvement. Because I used a quasi-experimental repeated measures design, there were limitations such as the threat to internal validity (Polit & Beck, 2018).

Threats to internal validity can affect the rigor of the study design. Selection which encompasses biases resulting from the preexisting differences between groups can threaten internal validity. The risk of selections can be minimized by having participants meet specific criteria to participate in the research (Polit & Beck, 2018). Mortality is the loss of participants who can occur as data are collected over time, which is a threat to my study. I tried to minimize mortality by reminding my participants of the upcoming data collection sessions and offered a small incentive for their participation. Maturation can occur over time, such as a lack of interest or motivation to complete the study (Polit & Beck, 2018). This could have occurred if the research period lasts longer than anticipated. To minimize this limitation, I kept to the timeline established knowing that maturation can occur because participants could gain new knowledge and may feel that it was no longer necessary to provide follow up glucose levels since they learned to manage their glucose levels.

Construct validity is an overarching term to assess the measurement procedure used to measure a given construct (Houser, 2015). Construct validity incorporates some other forms of efficacy, such as content validity. Thus, construct validity is seen as a process that one goes through to assess the validity of a measurement procedure, while some other forms of validity, such as tools, assess whether the measurement of the tool helps to measure a given construct (Polit & Beck, 2018). It was important to perform a thorough examination of a measuring instrument to the general framework being used to help guide the study (Frankfort-Nachmias et al., 2015). The tools used have been validated and are reliable since they have been used in other research studies.

External validity refers to the generalizability of the research to other settings or populations. The ability to generalize findings must be done cautiously since the population of study may not be transferable to a similar population in a different location (Polit & Beck, 2018). The sample used for this study comes from a community health clinic that provides free services to individuals who have no insurance or have insurance that does not adequately cover the cost of their care; this could limit the generalizability of findings.

Significance

This research was unique because it addressed an under-researched area related to older Latina women and how HL impacts their T2DM as well as how this group continues to experience health disparities more than their non-White counterparts (Ivano et al., 2015). Women of Latina heritage are especially at risk for the development of diabetes (Gandara & Ceja, 2015). Diabetes is the fourth leading cause of mortality among

Latinos and the eighth leading cause of death for the remainder of the female population (Ramos et al., 2010). Sixty-two percent of Latinas are overweight or obese compared to 49 % of whites and 28 % of Asian women 18 years and older (Gandara et al., 2015). About 30.3 million people, or 9.4% of the U.S. population, had diabetes in 2015 (CDC, 2017). The percentage of U.S. adults age 18 or older diagnosed with diabetes for Latinos is 12.1% (CDC, 2017).

Research suggests that improving participants' HL is a practical education and prevention tool to promote disease management behaviors, including balancing medication adherence (Miller, 2016). Low HL has been linked to a higher risk of death and an increased number of emergency room visits and hospitalizations (AHRQ, 2011a; Ivanov et al, 2015). Low HL is a stronger predictor of health outcomes than social and economic status, education, gender, and age (Lee et al. 2015). Additionally, less is known about older women, and, Latina women, who are one of the largest groups of women living in poverty and at risk due to their low literacy rate and chronic health conditions (Torres, 2014). The research study by Ivanov et al. (2015), validated that a gap related to HL and medication adherence does exist among older women with diabetes. Not being able to take the correct medication or adhering to medication prescribed further compromises health outcomes and increases patient mortality and morbidity (Brown & Bussell, 2011).

This research could lead to a positive social change and to develop culturally targeted health interventions that promote best practices for chronic illnesses such as diabetes. The results of this study could help the overall health needs of the Latino

population and enhance their lifestyles through an educational intervention improving their understanding about diabetes, how to cope with this chronic illness, and navigate through the complex health system.

Summary

Approximately 90 million adults in the United States have basic or below basic HL skills, and more than 110 million have limited numeracy skills (Moss, 2014). HL is a measure of a patient's ability to read, comprehend, and act on medical instruction, and it is needed to help individuals achieve positive health outcomes.

The prevalence of nonadherence is high and maybe the cause of increased morbidity and mortality among older Latina women (Blackburn, Swidrovich & Lemstrat, 2013). Understanding the significant role that HL plays in an individual's everyday life is critical to helping this group gain control of diabetes. Many factors, such as lack of knowing how to care for themselves with diabetes, the importance of HL, level of education, and their ability to provide for themselves, are all crucial if T2DM is going to be managed. Older Latina women tend to put their family's needs ahead of theirs. In a study conducted by Troncoso-Sawyer and Deines (2013), they suggest that many feel "torn between healthy behaviors" as being "self-indulgent" and secondary and altruistic self-denial that is often culturally expected of them as Latina matriarchs" (p. 672). Thus, this could be the barrier that has contributed to this lack of medication adherence and the cycle that has kept them from managing their diabetes effectively. In Chapter 2, I reviewed the relevant literature on older Latina women with T2DM and research on how

HL, medication, blood glucose levels, and HbA1c affect their ability to control their T2DM.

Chapter 2: Literature Review

Introduction

Health Literacy (HL) is the ability to make the necessary decisions related to how health outcomes affect functional health status; without this understanding, health cannot improve (Lee et al., 2015). The Institute of Medicine (IOM), in their landmark report, identified HL as a complex phenomenon that has moved from a narrow conceptual focus on patient literacy skills to a broader discussion that requires a patient to have the ability to interact with education, complex health-care systems, and cultural influences (Jordan, Buchbinder & Osborn, 2009).

Today, there is still no universally agreed definition for HL other than the one used by the World Health Organization (Chinn, 2011). Recognizing the importance of HL, it is essential to have strong HL skills if an individual is to navigate through the complex healthcare field. Not having strong HL skills affects patient adherence to the degree that they may not be able to follow treatment recommendations made by their healthcare providers (Miller, 2016).

One group that has been significantly affected is adults over 55 years of age due to having inadequate HL skills. Older adults with insufficient HL experience a decline in HL at about 55 years of age, due to polypharmacy and chronicity of illness (Carollo, 2015; Manafo et al., 2012). Studies have shown that individuals with insufficient HL are more often nonadherent with the medical advice given by their health providers (Duggan et al. 2014; Fleischer et al., 2016; Lopez & Golden, 2014,).

Research shows that Latina women over age 55 are one of the largest groups of women living in poverty and at risk due to their lower literacy rate and chronic health conditions (Torres, 2014). Miller (2016) conducted a meta-analysis and validated there is a correlation between HL and adherence to both medication and other medical interventions, especially among vulnerable patient groups, such as older Latina women. Older Latina women develop T2DM through a combination of genetic risk factors such as family history, ethnicity, and obesity, are all factors for diabetes and insulin resistance (CDC, 2011; Valencia, Oropesa-Gonzalez, Hougue & Florez, 2015). Ramos et al. (2010) reviewed Latinas' health problems and found that few researchers have made an effort to document the gravity of diabetes in this population and have offered little insight into diabetes or that it is the fourth leading cause of mortality.

Nonetheless, older Latina women have higher rates of morbidity; mortality is impacted when their basic HL level is low (Ivano & Wallace, 2015). Prevention and self-management are essential and depend on patient involvement and interaction with the provider. Latina women born in 2000 have a 52.5% risk of developing diabetes in their lifetime, which exceeds the 31.2% risk for non-Hispanic white females (CDC, 2011; Duggan et al., 2015; Ivanov et al., 2015). Duggan et al. (2015) found that Latinas are likely to have poor glucose control and less likely to use diabetes medical and self-practices, such as regular follow up visits and self-monitoring of glucose levels.

The purpose of this quantitative, quasi-experimental one-group repeated measures study was to determine what effect an educational intervention would have on blood glucose levels, HL, and medication adherence in older Latina women with T2DM.

Chapter 2 includes key literature search strategies, the theoretical foundation, and rationale for its selection, and an in-depth review of the current literature related to the HL and medication adherence in older Latina women who have T2DM.

Literature Search Strategy

I performed a literature search using electronic databases available through the Walden University Library. The databases utilized included the Cumulative Index of Nursing and Allied Health Literature (*CINAHL*) and MEDLINE simultaneous, ProQuest, EBSCOhost, Ovid, Academic Search Premier, PsycARTICLES, PsycINFO, *Thoreau Multi-Database Search*, and SOCindex databases. The following key terms were used in the searches: *diabetes, Type 2, T2DM, glycemic control, blood glucose, health literacy, medication adherence, Latina women, Hispanic women, and older Latina women*. The search was restricted to the period from January 2010 to the present. All terms were searched in various combinations to increase citation numbers and gain a sense of how the concepts were interrelated. Additional information was obtained from government databases and other medically related organizations, such as the Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services (DHHS), National Institutes of Health (NIH), Agency for Healthcare Research and Quality (AHRQ), American Diabetes Association (ADA), American Medical Association (AMA), American Nurses Association (ANA), Texas Diabetes Council and the Texas Department of Health.

Theoretical Foundation

I selected the HBM as the framework to offer a sound theoretical basis for understanding the behaviors that influence older Latina women's beliefs related to T2DM, and the impact HL has when dealing with chronic disease. The HBM has been used in Latina women's health practices and is one of the most predominant models in nursing practice (Garcia, 2016), and it was one of the first theories used in the study of health behaviors. The HBM was developed in the 1950s by a group of U.S. Public Health Service social psychologists who wanted to learn why so few people participated in programs to prevent and detect disease (Garcia, 2016). The primary concept of the HBM is "readiness to action," which is directly determined by the individuals' beliefs concerning their susceptibility to sickness and the perceived benefits of trying to decrease the occurrence of disease (Garcia, 2016).

The HBM was designed to show how to prevent or reduce the risk of disease and what health promotion behaviors a person can take to improve health. This theory illustrates that behavior is dependent upon two variables: (a) that an individual has a goal to attain, and (b) is the likelihood that the individual can achieve the goal. The HBM has contributed to the nursing knowledge and applied to human-environment health relationships with a post-positivist perspective. The HBM model goes on further to explain that all individuals have a desire to avoid illness and a belief that if one implements change in one's behavior, that change might result in improved help (Garcia, 2016).

The HBM consists of six concepts (see *Figure 1*):

1. *Perceived susceptibility* refers to a participant's perception of the risk related to acquiring a disease or illness. An example could be at risk of developing T2DM.
2. *Perceived severity* relates to a participant's threat of illness. An example of perceived severity would be the patient whose fasting glucose is higher than 500 mg/dL.
3. *Perceived benefit* refers to – how the patient will be adherent to the recommended treatment to reduce further risk of complications. An example of perceived benefit would be the patient taking the drugs prescribed to control the blood glucose level.
4. *Perceived barriers* – relates to barriers or obstacles they may place upon themselves. An example would be not to take medications as prescribed due to a lack of knowledge or lack of funds.
5. *Cue to action* refers to the reaction an individual might have to a diagnosis or laboratory result, such as learning about a high blood glucose level > 250 mg/dl.
6. *Self-efficacy* – relates to the individual's ability to be confident and able as a person when adapting to the treatment and intervention needed to maintain positive health outcomes.

The HBM was selected as the framework to understand the behaviors that influence older Latina women's beliefs related to T2DM, and the impact HL has when dealing with chronic disease. The HBM has been used in Latina women's health practices

and is one of the most predominant models in nursing practice (Garcia, 2016), and it was one of the first theories used in the study of health behaviors. The HBM was used because it shows that individuals are self-reflective, and if given the proper education and tools to understand their illness, they may be able to improve their health outcomes. The HBM suggests that whether or not an individual will take action to see their physician for screening or treatment for illness, is dependent on how that individual perceives their predisposition to becoming ill (Garcia, 2016).

Participants who have T2DM or have been diagnosed recently must decide how they want to improve their health. The HBM postulates that individuals perceived susceptibility and severity would be addressed or resolved through educational intervention, thus allowing them to take action to empower themselves to control their T2DM. Discussing the construct of perceived seriousness through an educational intervention can validate to the participant the importance of taking medications as prescribed and could improve changes leading to a positive outcome. The overall goal for using the HBM is that it will help the older Latina woman recognize that behavioral modification through the use of an educational intervention, such as glucose monitoring, and medication adherence can affect a positive difference in both glucose levels and HA₁C results which relate to the constructs of self-efficacy and cues to action. Al-Subhi, Kendall, Al-Shafae, and Al-Adawi (2015) found that using the HBM as their framework helped them to elicit insights into the beliefs of their participants in regards to diabetic management and outcomes. Shabibi et al. (2017) also used the HBM in their research as a guiding framework because diabetes is one disease that requires that participants have a

significant role in its control, and also it is impossible for participants to be under the control of healthcare supervision at all times. Karimy, Araban, Zareban, Taher, and Abedi (2016), found that the HBM could be adapted as a framework to help with the improvement of self-behaviors of women with diabetes and can aid in the development of educational programs, where adherence to self-care might be improved. Agrali and Akyar (2014) utilized the HBM to guide their study and found that older diabetic participants did not tend to perceive diabetes as a severe disease nor did they have a firm belief about illness susceptibility related to personal factors such as age; gender, or even financial implications related to the disease.

The HBM conceptual framework (see *Figure 1*) provides a useful tool for interpreting ways in which an educational intervention can help this group understand why HL, medication adherence, and glucose control can work together to improve their quality of life.

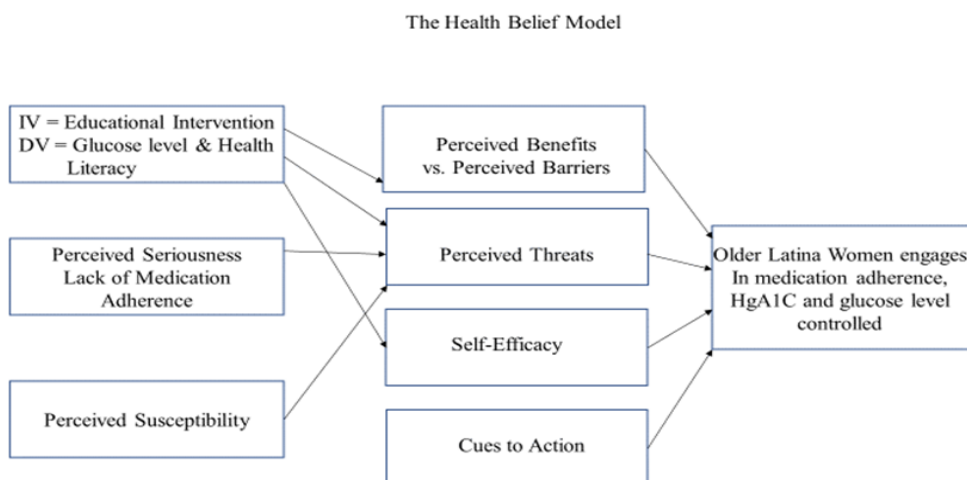


Figure 1 – Health belief model adapted based on Rosenstock, Strecher, & Becker 1988, p. 177

Literature Review related to Key Variables

The Older Latina Women

Women of Latina heritage living in the United States have a prevalence of T2DM that is almost twice as likely when compared to non-Latina women (Barrera, Toobert, Strycker & Osuna, 2011). In addressing this health disparity, there is a clear need for additional action to help Latina women improve their health and make lifestyle changes in the management of T2DM (Paz & Massey, 2016). In a study conducted by Ramos, Jurkowski, Gonzalez, and Lawrence (2010), the researcher found that there is limited data on the healthcare of older Latina women due to the group seldom being reported separately by gender. Research explaining health disparities by ethnicity and gender can help to impact both professional and public awareness of the difficulty faced by the older Latina woman. Ramos et al., 2010 indicated a necessity to provide more gender-specific data for this segment of the population related to health outcomes.

T2DM poses a significant challenge for older Latina women representing a higher burden for this cohort, and more research and interventions are needed to lessen this disparity (Valencia et al., 2015). Older Latina women who live in the U.S. long-term are at higher risk of being diabetic compared to their counterparts who are immigrating from Mexico, Central, and Latin American countries (Valencia et al., 2015). However, research describing the barriers for older Latina women can communicate with their healthcare provider in English, the Latina woman may not understand the medical

verbiage used by the healthcare provider since English is not always their primary language (Oomen, Owen, & Suggs, 1999). Paz and Massey (2016) found that Latinas identified barriers such as fear of results, the embarrassment of being touched, access to health care, and language as issues for not being regularly screened for diabetes. Additionally, Latina women experience other problems such as a high risk of low HL, lack of education, and poverty. In 2012, the poverty rate for Latina women was 27.9 %; thus, medications or a glucose monitor to manage their diabetes may prove challenging (Jackson, 2013). Further, Latina women are one of the largest groups of women living in poverty and lower literacy rates and placing them at risk of many chronic health conditions linked to poverty and reduced literacy (Torres, 2014). The Latina woman serves as the matriarch of her family and teaches the importance of shared beliefs, values, and habits (O'Brien, Shuman, Barrios, Alo, & Whitaker, 2014).

The older Latina has a life expectancy of 77.1 years, which is lower than the non-Latinas at 79.6 years (Paz & Massey, 2016; Ramos et al., 2010). Diabetes is the fourth leading cause of death among Latinas and the eighth for the remainder of the female population (Ramos et al., 2010). Latina women's' mortality from diabetes of all ages is 17.5 per 100,000 (U.S. Census, 2010). The AHRQ (2015) reports that Latinas continue to have problems related to access to health care.

Prevention and self-management are essential issues that are dependent upon patient involvement and interaction with their medical provider. Healthcare providers should recognize that action is needed to address the needs of older Latina women by targeting risk factors that could lead to complications related to T2DM specific to Latina

women. Ramos et al. (2010) found that Latina women in research studies are underrepresented. Often these women have less access to health care and are much younger than their non-Latina counterparts when diagnosed, at about 45 years of age on average, with T2DM.

Older Latinas face many age-related changes that affect the clinical presentation of diabetes, such as insulin resistance, along with the added impairment of hepatic glucose metabolism (Bigelow & Freeland, 2016; Gilden & Gupta, 2015). Individuals under the age of 65 years typically do not present with the classic triad of symptoms of polyphagia, polydipsia, and polyuria (Bigelow & Freeland, 2016). As one reaches 65 years of age, these symptoms may not be seen (Bigelow & Freeland, 2016). The physiological changes in aging can make recognition and treatment of T2DM problematic for medical providers. Chau and Edelman (2001) found that often individuals above age 65 years are not aware of having T2DM because the older diabetic presents with no symptoms of hyperglycemia or polydipsia.

Older Latinas face another problem that is unique as they age, which is the increase in polypharmacy since many have one or more chronic illnesses in addition to T2DM (Bigelow & Freeland, 2016). Older Latinas deal with issues related to pharmacokinetics and pharmacodynamics, which impact medication being absorbed, distributed, metabolized, and cleared. Polypharmacy can further complicate matters if the patient has low literacy skills and are unable to manage their medication regime due to low literacy (Chau & Edelman, 2001).

Type 2 Diabetes in the Latino Population

The epidemic of T2DM is a significant social health problem, affecting more than 30.3 million people of all ages in the United States (CDC, 2014; Valencia et al., 2015). In the last 20 years, this number has more than tripled as the U.S. population ages. This disease poses a significant risk for Older Latina women, and more research and interventions are needed to lessen this disparity (Valencia et al., 2015).

Currently, in the U.S. diabetes places older Latina women at risk for heart attacks, stroke, blindness, kidney failure, obesity, and loss of extremities. Older Latinas with T2DM are a vulnerable population of interest because of their increased risk for chronic diseases, changes in body composition such increase abdominal obesity, higher risk for fracture, decreased functional status such as reduced walking due to arthritis, cognitive impairment, and the lack of HL which affect this group. Schneiderman et al. (2014) found a high prevalence of diabetes, along with the low rates of diabetes awareness, diabetes control, and health insurance. Furthermore, they found that there were negative correlations between diabetes prevalence and both household income and education among Latinos in the U.S. These findings have significant implications for public health policies.

Based on the U.S. Census (2013), the Latina population is the second largest ethnic minority group in the United States and one of the fastest-growing to date. Jackson (2013) found that older Latina women are less likely to have the appropriate health coverage until after 65 years of age if they qualify for Medicare or Medicaid. In this same study, women from this population earn less pay due to the type of work

performed, such as domestic work, and often many live in single heads of households to support their families.

Health Literacy

Inadequate HL is a particular problem for T2DM. Disease self-management is needed to make decisions regarding daily self-care for the individual to live with and control their T2DM. One of the goals of *Healthy People 2020* is to reduce disparities in health care (DHHS, 2019). It is considered an essential strategy for achieving this goal in the poor and underserved communities in the US to improve HL (DHHS, 2019). HL is defined as the degree to which individuals can obtain, process, and understand the necessary health information to make an appropriate health decision (White et al., 2013).

The self-management routine for T2DM is one of the most challenging of any chronic illness (Hahn et al. 2015). Hahn et al. (2015) showed that the results of a systematic review indicated that individuals with lower education or literacy might be especially vulnerable because they are not able to understand and effectively apply educational materials. Review of literature supports that there is abundant evidence that links health literacy to a wide variety of adverse health outcomes, including increased hospitalization, increase use of emergency care, inappropriate use of medication, worse health status, and mortality (Son et al., 2017).

Latinas with T2DM often experience both suboptimal processes of care, which impact diabetes-related outcomes compared to their non-Hispanic white counterparts (White et al., 2013). Participants who have low HL are at risk for poor communication with their physicians (Hahn et al., 2015). Moss (2014) found that Latina women

reported a sense of shame about their literacy skill level, and as a result, they felt they had to hide their reading and vocabulary difficulties to maintain their dignity. Having to keep their lack of literacy skills hidden is not acceptable and shows that a low HL does present barriers to these individuals when healthcare providers show a lack of empathy. White et al. 2013 found that according to the *National Assessment of Adult Literacy*, approximately 66% of Latinas have basic or below HL skills; thus, validating HL is a significant problem.

Low HL is common among individuals with diabetes and is associated with poor disease-specific knowledge and the importance of glycemic control (Hahn et al., 2015). Individuals with inadequate HL are at risk for poor communication encounters with their physicians. As a result of this lack of communication, these individuals are less likely to ask questions of their providers or be less involved in their disease management (Hanh et al., 2015). Delgado and Wenzel (2010) noticed that often it is the health care provider that may not recognize that individuals do not understand health information, which negatively impacts compliance, causing an increase in complications and reducing participation in preventative health programs.

HL is hampered by limited English language proficiency and considered one of the most reported barriers encountered by individuals due to their inability to access, understand, and utilize health information. Often one concern that is voiced by Latinas is their fear of being taken advantage of, maltreated, ignored, or refused services (Rojas-Guyler, Britgan, King, Zulig, & Vaughn, 2016). Having literacy skills opens the door to take medications appropriately or interpret glucose test results from a glucose monitor.

Bohanny et al. (2013) identified in their research that HL is essential for individuals to have the capacity to obtain and process the necessary health information and services to maintain health.

Fransen, von Wagner, and Essink-Bot (2011) found that implementing optimal diabetes self-management, participants must have adequate HL. Evidence for the association between HL and diabetes self-management is insufficient and may vary within the domains of self-management. One construct from the HBM related to self-efficacy is the “belief in one’s capabilities to organize and execute the courses of action required to manage the respective situation” (Bandura, 1994, p. 2; Bohanny et al., 2013). Another vital part of Bohanny et al. (2015) shows self-efficacy to be an essential predictor of self-care behaviors with a patient who has T2DM. These results indicate that HL is an antecedent to self-efficacy, and the influence of HL on self-care behaviors may be mediated entirely through self-efficacy (Bohanny et al., 2013).

Fransen et al. (2011) conducted a literature review related to diabetes self-management in participants with low HL. Researchers found 11 relevant studies showing a positive association between HL and specific diabetes domains such as knowledge, beliefs, self-efficacy, and social support. Fransen et al. (2011) identified several gaps in the research related to HL and diabetes self-management. Fransen et al. (2011) indicated that additional longitudinal studies in HL and diabetes self-management are essential to enable evidence-based development of interventions to increase adequate and sustainable self-management in T2DM participants with low HL.

Low HL occurs more frequently in marginalized populations, including people with limited education and income and older adults (Carollo, 2015). This impact of low HL is notable in older adults, over the age of 65, with the most significant decline noted after age 55 (Carollo, 2015; Manafo & Wong, 2012). Latina women, in general, serve as the primary caregiver and resource of health care in families. A well-informed woman can positively impact the health of the family and community (Carollo, 2015). The burden of low HL, therefore, has an impact beyond the individual, influencing the quality of care for families and communities. The study by Carollo (2015) supports the current literature that minimal HL does affect limited health care access, health promotion, disease prevention, and health outcomes. Low health literacy presents a wide-reaching barrier to disease control that, unlike race, ethnicity or socioeconomic reasons for nonadherence.

Medication Adherence

There is a sizeable body of literature that demonstrates a positive association between medication adherence and glucose control. However, the methodologies of these studies have weaknesses that include small sample sizes, selective populations, and subjective patient-reported measures, which limit statistical significance and generalizability (Feldman et al., 2014). Diabetes and its complications are a significant concern in healthcare management and clinical practice due to participants who are unable to achieve targeted glycemic levels. While oral medications are one of the primary tools used to prevent and effectively manage chronic illnesses such as T2DM, medication

adherence is a challenge for both participants and healthcare providers (Bosworth et al., 2011).

Half of the 3.2 billion annual prescriptions dispensed in the US are often not taken as prescribed (Bosworth et al., 2011). Findings reveal that polypharmacy in participants presents an enormous problem validating why the prevalence of nonadherence is so difficult for participants to achieve positive health outcomes (Bosworth et al., 2011).

T2DM complications arise from poor self-management and could be prevented or further delayed by participants if they understood the importance of adherence and taking medications as prescribed. Adherence is a complex behavior, and interventions have shown only limited effectiveness regarding improving adherence and clinical outcomes (Patton et al., 2017). Bosworth et al. (2011) research found that

interventions to improve adherence with prescribed medications are more successful for short-term treatments than for long-term, chronic illness management. Findings makes medication adherence more challenging to manage because of the barriers encountered by Latina women with T2DM. Those barriers are tied back to low literacy, limited English proficiency, lack of financial resources, and is either underinsured or not having monies to purchase healthcare.

In a research study by Blackburn, Swidrovich, and Lemstra (2013), showed that the prevalence of nonadherence is high and appears to be an essential cause of increased morbidity and mortality among individuals with T2DM. Blackburn et al. (2013) reported that all nonadherence related hospitalizations identified T2DM as the second leading cause of admission while working with four US hospitals. Individuals who are not

adherent to their medications can be a costly problem not only for the individual involved but for the healthcare system as a whole. Since there is no gold standard regarding how to measure adherence, one of the difficulties in managing low adherence is the lack of accurate and affordable measures (Steward, McNamara & George, 2014).

Mayo-Gamble and Mouton (2018) found that for older adults, understanding instructions can be a challenge when taking medications. Often these individuals leave their healthcare providers office without a real understanding of how their medications work to help with controlling their glucose levels and much less when they should be taken. It is this disconnect that results in poor adherence to prescribed medication regimens resulting in complications that lead to morbidity and mortality.

Results of a study conducted by Polonsky (2016) revealed that poor medication adherence in T2DM was linked to nonpatient factors like the lack of integrated care in many healthcare systems, low education level, low-income level, and the patient's beliefs that their medications are not sufficient because their glucose level remains uncontrolled after one week's usage. Results also showed that medication adherence in those with T2DM remains poor despite the availability of many new classes of medications and increased effort toward patient education and targeted interventions that address adherence.

Evidence from a systematic review of literature conducted by Capoccia, Odegard, and Letassy (2016) suggested that when a patient has high literacy skills, they are less likely to have issues with medication adherence when it comes to T2DM. Having higher adherence was associated with improved glycemic control, fewer emergency department

visits, decreased hospitalization, and lower medical cost for participants with T2DM. Further findings from Capoccia et al (2016) found that evidence showed that medication adherence is a significant challenge for those with T2DM, with glucose rates essentially unchanged since 2007. Findings by Capoccia et al. (2016) also state that future research is needed to identify accurate assessment techniques to confirm specific interventions that can address the challenges and barriers to adherence.

Latina participants have suboptimal glycemic control as compared to non-Latinos. One of the critical factors for achieving optimal diabetes management and control is medication adherence. In a research study conducted by Colby, Wang, Chhabra, and Perez-Escamilla (2012), found little research on the Latino/a population related to medication adherence. They noted that studies with limited external validity to the Latina population with health disparities, broadly defined as participants who experience different health outcomes due to factors such as health literacy and access to health is limited. Colby et al. (2012) stated that if changes regarding medication adherence are learned participants, it will be essential to identify independent predictors of poor medication adherence in the Latina population. This research also determined that medication adherence correlates with better control of diabetes is further increased when participants receive support from their doctors.

Summary

Disparities in health outcomes and healthcare are prevalent among Latina women (Ramos et al., 2010). Latinas have historically played an invisible role in the policy arena. At least 45% of participants with T2DM fail to achieve adequate glycemic control, such

as an HbA1c of less than 7%. While approximately 50% of participants do not take medications as prescribed, Latina women are at high risk not only with attempting to control their diabetes, but they also have poor medication adherence and have low literacy rates (Brown & Bussell, 2011; Ontiniano et al., 2012).

Multiple studies, dating back to the early 1990s, have demonstrated the correlation between literacy and the ability to function not only within society as well as in the healthcare setting (Carollo, 2015). Participants with low health literacy contribute to increases in health care expenditures through less frequent use of preventive health services, poorly managed chronic illness, and regular use of emergency department services (Carollo, 2015).

This study was unique because it addressed the under-researched area of low HL in Latina women with T2DM, who experience health disparities about Type 2 diabetes more than their non-White counterparts (Ivano et al., 2015). Women of Latina heritage have a genetic predisposition for the development of diabetes and a 32.6% chance of being diagnosed with diabetes between the ages of 65-74 years of age when compared to 18.4% of non-Latina women (CDC, 2020; Ivano et al., 2015).

Low health literacy is a burden to individuals and society, with global implications affecting the most vulnerable (Carollo, 2015). The research study by Ivanov et al. (2015), validated that a gap related to health literacy and medication adherence does exist among older women with diabetes. Huang, Shivanbola, and Smith (2018) indicated there remains a gap in trying to link an exact path related to the control of T2DM. Also, diabetes is recognized as a significant threat to the health of the growing Latino

population in the U.S. (Harris et al., 1998; Otiniano et al., 2012). There is a need for health and social policy designed to take action against health and health care disparities for Latinas are long overdue. In Chapter 3, a detailed explanation described the methodology I planned to undertake in this research study.

Chapter 3: Research Method

Introduction

The purpose of my quantitative, quasi-experimental repeated measures study was to determine what effect an educational intervention would have on blood glucose levels, HL, and medication adherence in older Latina/Hispanic women with T2DM. In chapter 3, I detail the research design and methodology, and address my use of the target population under investigation, sampling and sampling procedures, recruitment procedures, participating and data collection, and informed consent to participate in this study.

Research Design and Foundation

A quasi-experimental, repeated measures research design is best suited to study objective characteristics and human responses that can be quantified, which will allow to describe what is standard, and universally reasonable (Houser, 2015).

Study Variables

According to Creswell (2014), a quasi-experimental design is used to establish the causation between the variables. The independent variable is identified, and its effects are measured (Creswell, 2014). The design of the study was a one-group repeated measures design with an educational intervention (see Appendix A). The independent variable was an educational intervention that was provided to women who are participating in a 3-week study. The educational intervention covered five topics: taking daily medication, glucose monitoring, sick day rules, foot care, diet, and exercise to help with the management of diabetes. The *Brief Medication Questionnaire 1 (BMQ 1)*; see Appendices

B and C) was used to measure the participants' self-reported level of medication adherence. The dependent variables to be assessed are glucose levels, medication adherence, and HL. HL was determined using the *Short evaluation of HL – English & Spanish* (SAHL-S & E, 2016; see Appendices D and E) developed by the Agency for Research and Quality of health (AHRQ, 2016) to test the level of literacy of participants. *The Michigan Diabetes Knowledge Test (MDKT2)*; see Appendices F and G) developed by Fitzgerald et al. (2016), was used to evaluate the diabetes knowledge level of the patient using a set of basic questions to gauge what is objectively known or not by the patient before the intervention (Quandt et al., 2014; see Appendices F and G). Gaps identified inpatient knowledge can help diabetes educators and physicians to obtain baseline information (Quandt et al., 2014). Limitations are known to occur in a research study and can be attributed to the design or methodology selected, which can impact or influence the application or interpretation of the results of the study. One concern for this study was the generalizability of the findings because this study deals with a specific targeted population. Time constraints could occur when attempting to obtain information from the participants due to their lack of HL or the ability to read the instructions given to them when trying to administer instruments to be used in this study. The problem was that if the participant was unable to understand each instrument, then, I planned to meet one-on-one with the participant individually during this session. It is estimated that this would take from 20 to 30 minutes to complete each instrument used for this study. Cost of resources, such as reproduction of test questionnaires, supplies such as pens, pencils, the paper used to copy the test, and demographic data was \$200.00.

Using a repeated measures design allowed me to conduct the intervention on the same group of participants over a designated period of time. A repeated measures design helps to reduce variability because the same participants participate throughout the intervention, which can aid in drawing important statistical conclusions with a relatively small set of participants (Kraska, 2012). Houser (2015) found that “the independent variable precedes the dependent variable, and the influence of the independent variable can be measured”(p. 331). Quasi-experimental studies do have the ability to provide robust evidence because they meet two of the three conditions for inferring causality. One weakness when conducting a quasi-experimental design was the lack of randomization of participants. I interpreted my data using the Statistical Package for Social Sciences (SPSS) software, version 25.

I planned to use an educational intervention which helped to improve participants’ understanding related to the fundamental concepts of T2DM and medication adherence. The educational intervention included teaching material developed by the ADA which is used by both Certified Diabetes Educators and physician offices. A copy of the script used in the teaching intervention was reviewed with a Certified Diabetes Educator to ensure its validity (see Appendix A). I then administered the *Michigan Diabetes Knowledge Test (KDT2)*; see Appendices F and G) developed by Fitzgerald et al. (2016) and used the same instrument on the posttest to see if knowledge has increased (Appendices F and G). Cusack et al. (2018) found that educational interventions do improve concepts and help build confidence, attitude, and behavior in participants in their study. Zhao, Suhonen, Koskinen, and Leino-Kilpi (2017) found that providing

individuals with educational interventions is essential to support and improve the overall wellbeing of participants who have T2DM.

Methodology

Population

The target population of this study was Latina women who are over 55 years of age who live in South Central Texas and have T2DM. The women in this study lived within the community and attend a free community health clinic in the surrounding area of South Central Texas. The target population size was approximately 60 individuals who visit the free community health clinic receive medical care for the treatment of their T2DM and meet the criteria established for the study.

Sampling and Sampling Procedures

A convenience sampling was used to recruit Latina women who had T2DM who regularly attended a community health clinic and received care for their T2DM will be recruited to participate in my study. I received IRB approval #11-05-19-0511221 from the Walden IRB; posters were placed in strategic locations within the clinic's common waiting areas to inform potential participants of the research study for up to one month or until sample size was obtained. The posters were written in English and Spanish (see Appendices J and K). If a Latina woman with T2DM expressed interest in being in the study. Once I knew that the individual had expressed an interest, each participant was contacted by telephone and an appointment made to meet one on one with each participant to discuss the study wanted to participate.

The Latina women who were eligible for my study had to attend a clinic for their T2DM care, had to speak either Spanish or English, be 55 years and older, received their care from the community health clinic, and took only oral hypoglycemics to control their T2DM. Exclusion criteria were women who are not of Latina heritage, were under 55 years old, and used insulin to control their T2DM.

I conducted a power analysis using G* Power 3 (Faul, Erdfelder, Lang, & Buchner, 2007) to calculate a sample size based upon the chosen power, effect, and size of the group needed to conduct a one-way repeated measures MANOVA test with three measurements. A priori alpha 0.05, the power of 0.80, and an estimated effect size of 0.5 (medium effect) as qualifiers based on acceptable standards of social research and previous research studies with one-way repeated measures within groups MANOVA (Field, 2013). Having an appropriate sample size can lead to higher sensitivity to demonstrate how the outcome occurs because of the experimental procedures (Creswell, 2014). The resulting sample size was determined to be 17 participants.

Procedures for Ethical Procedures, Recruitment, Participation, and Data Collection

Recruitment. Before initiating the study, I made a written request to the community health clinic administrator to conduct my research study. Approval by the Walden Institutional Review Board (IRB) approval was received, I had the participant sign both a HIPAA and an informed consent form to participate in the study. All participants who provided consented had their identities protected. All study documentation was kept in a locked file cabinet. As a researcher, it is essential to protect the participants to make sure that they understand the risk and benefits of the study they

have agreed to participate (Polit & Beck, 2018). Copies of documents signed by the participants' was provided to them at the time of signing in this document. It will reinforce that confidentiality will be protected during the study as well as having the right to withdraw from the study without fear of reprisal.

I contacted the community clinic and requested permission from them to conduct my research study at their clinic. I received approval from their Administrator to do this study since they have such a large group of Spanish-speaking Latina women in need of education related to their T2DM. A letter of permission was given by the Administrator to carry out my research study at their clinic.

This free community clinic provides services to members of a county in the Southwestern U.S. who are underinsured or have no insurance coverage. The clinic consists of volunteers who live within the community. The volunteers of this clinic are physicians, nurse practitioners, physician assistants, registered nurses, and lay individuals. The primary services of the clinic are to provide care for chronic illnesses such as hypertension, diabetes (both Type 1 and Type 2), and dental care. There is also a food pantry. Most individuals who come to the clinic live at or below the United States poverty level and are not eligible for Medicaid/Medicare insurance coverage or no insurance at all. They access the local hospital emergency room for care or are referred by local physicians because they have no money to pay for medical care. Fliers will be posted in the shared waiting areas of the clinic, both in English and Spanish. The flyer contained the type and purpose of the study, whom to contact for further questions should they be interested in participating. Participants who expressed interest were informed

about the requirements and allowed to withdraw if they so choose at any time. The participants who complete the study received a \$10.00 gift card to thank them for their participation.

Data collection. I collected data from the participants who have agreed to participate in my study at the three scheduled periods, as described below.

First data collection. Once the participant received an overview of the research and met inclusion criteria and expressed a verbal willingness to participate, I made an appointment to meet by phone to meet one-on-one in person with each participant to begin the data collection process in a private area provided by the clinic. I collected demographic data one-on-one to clarify any questions a participant might have had (Polit & Beck, 2018). The demographic data included: (a) age; (b) highest level of education; (c) primary and secondary language spoken; (d) contact telephone number; (e) marital status; (f) age when diagnosed with T2DM; (g) how many visits have they made to see the healthcare provider in a three month period; (h) if the participant has had education on how to care for themselves related to their diabetes; (i) if they check their blood sugar and frequency of the check; (j) date of their last hospitalization for T2DM complications; (k) list of chronic diseases; and (l) current medications currently being taken. Information related to their HbA1c and fasting random glucose came from the electronic medical record (EMR) at the clinic. Demographic data collected contained no identifiers other than how data collected were coded regarding the participant beyond the demographic information needed for the study. I was the only person that had access to the study information of participants. Once demographic data was collected privately during the

one-on-one appointment time with the researcher, administration of the *SAHL – S&E* (*HL*; see Appendices D and E), the *BMQI* (see Appendices B and C), and the *Michigan Diabetes Knowledge Test 2* questionnaire (see Appendices F and G). If the participant had difficulty reading the questionnaires used for the study, the researcher would assist them as needed. I asked each participant to perform a glucose test using their own glucose monitor and record it in their monitoring log to document their results and bring the log each time I met with them (see Appendix K). I made an appointment with participants who consented to return in 1 week for the educational intervention, blood glucose check, and completion of the *BMQI* (see Appendices B and C) and the *Michigan Diabetes Knowledge Test 2* (see Appendices F and G) questionnaires.

Second data collection. Participants returned in 1 week to participate in an educational intervention. The educational intervention will be done in the educational classroom located in the clinic. The classroom holds a maximum of 10 participants and will be scheduled at an allotted time to attend their educational intervention. Plans were to hold educational sessions during this collection period. I planned to post times for the educational sessions to be held at 9:00 a.m., 1:00 p.m., and 4:00 p.m. during the day. More sessions would be scheduled if needed. Each session was planned to take approximately one to one and a half hours to complete. Two days before the educational intervention, I called each participant by telephone to remind them of their appointment. This visit was separate from their regular medical visit. The educational intervention included information on the importance of glucose monitoring, sick day rules, the importance of hygiene, diet to include food preparation on a limited income, exercise,

and the importance of adherence to medications (see Appendix A). The educational intervention outline was approved by a certified Diabetes Educator that works with this Hispanic population. After the educational intervention, a posttest on the BMQ1 (see Appendices B and C) and Michigan Diabetes Knowledge Test 2 (see Appendices F and G) were administered. The blood glucose monitoring was reviewed from each participant's personal log and their readings were noted in their record. Reviewing the blood glucose log was part of the intervention. I scheduled a third and final visit with each participant one week after the educational intervention.

Third data collection. I contacted participants within 1 week after the educational intervention by telephone to remind them of their return office visit. At this visit, I met with each participant individually and asked each person to perform a blood glucose test with their glucose monitor. I documented their third glucose test results. I then administered the *BMQ1* and the *Michigan Diabetes Knowledge Test 2* (Appendices B, D and F).

Participant exit procedure.

The final step of data collection was to give each participant a gift card for \$10 from Walmart™ thanking them for their participation in this study after the third visit was completed.

Instrumentation and Operationalization of Constructs

In this study, three self-reported instruments to measure the concepts of health literacy, drug adherence, and diabetes awareness were used. Medication adherence is the active, voluntary, and collaborative participation of a patient in the course of mutually

acceptable behavior to produce a therapeutic outcome. (Brown & Bussell, 2011).

Medication adherence was measured using the *Brief Medication Questionnaire 1 (BMQ1)*; see Appendix B and C). Tang, Quang, and Rabi (2017) found in their research that while the medication is essential, there remains no standard operational definition for adherence to medication. Thus, this definition may be difficult to operationalize and requires further investigation.

Health Literacy is defined as the capacity to obtain, communicate, process, and understand the necessary health information that influences self-management behaviors and individual outcomes (Shiyanbola et al., 2017). HL was determined using the *Short-Assessment of HL – Spanish and English* (Lee et al., 2016; see Appendices D and E). The *Diabetes Knowledge Test (KDT2)* developed by Fitzgerald et al. (2016), was used to evaluate the diabetes knowledge level of the patient using a set of basic questions to objectively gauge what is known or not known by the patient before the intervention.

The Brief Medication Questionnaire 1 was chosen (Appendices B and C) to measure if the participants involved in the study adhered to their medication regime and what barriers could be hindering their adherence. This questionnaire was developed by Svarstad, Chewning, Sleath, and Claesson (1999) and designed to screen for adherence and barriers to adherence. The original tool included a 5-item Regimen Screen that asked the patient how they take each medication in the past week. Validity was assessed in 20 participants using the Medication Event Monitoring System (MEMS). The results varied depending on the type of nonadherence with the Regime and Belief Screens having a sensitivity of 80 to 100% to "repeat" nonadherence, and recovery screen with a sensitivity

of 90% for nonadherence "sporadic." A total of 48 participants were recruited in three pharmacies. The criteria included participants who resided in noninstitutional settings and had three or more drugs that were taken daily. Participants were randomly allocated to two control groups.

The *BMQI* is comprised of two sections: (a) the specific *BMQI* (Specific-Necessity and Specific-Concerns; 10 items), which assess beliefs about the medication prescribed for personal use; and, (b) the *BMQ-General* which has eight items, assessed beliefs about medication in general (Svarstad et al., 1999). The two sections of the *BMQI* was used in combination or separately, with all items having a five-point Likert answer option, which varies from *strongly agree* to *disagree strongly*. The higher the scores by participants, indicate stronger beliefs about the similar concepts in each subscale. The *BMQI* has been translated from English to many languages (Granås, Norgaard, and Sporrang, 2014). The analysis of internal consistency for the overall *BMQI* using Cronbach α coefficient was 0.65 on the original *BMQI* reliability, the regimen, belief, and recall screens having Cronbach α coefficient values of 0.71, 0.84, and 0.76, respectively. Previous studies evaluating translated versions of the *BMQI* have demonstrated similar values for internal consistency, with the Portuguese version having a Cronbach α coefficient of 0.66. In a reliability analysis of a questionnaire, it is ideal when the Cronbach α coefficient > 0.70 , but values > 0.55 are considered acceptable (Lavsa, Haolzworth & Ansani, 2011). A systematic review showed that the *BMQ I* is a valid questionnaire that, compared to some other medication adherence questionnaires, allows self-efficacy to be assessed, which enhances the use of the questionnaire in

medication management (Lavsa, Haolzworth, & Ansani, 2011). The examination of the *BMQI* showed that the regimen, belief, and recall screens performed better than the overall *BMQI* with a higher Cronbach α coefficient value (Verhagen, 2018). Patient-reported adherence and barriers to adherence are measured separately because there are circumstances where the researcher or clinician plans to target participants with a certain type of nonadherence or a certain type of barrier to adherence. For example, a positive recall screen often predicts “sporadic” nonadherence due to forgetting. This type of nonadherence can be reduced by tailoring the dosage schedule, providing a medication organizer or memory aid, and simplifying the regimen. Thus, the *BMQI* can be used to manage specific types of nonadherence or barriers to adherence. I received permission to use the *BMQI* Tool from Dr. Laura C. Svarstad et al. (2018; see Appendix I).

The Short Assessment of Health Literacy -Spanish & English Test (see Appendix D and E) was used to develop and validate a comparable health literacy test score for Spanish-speaking and English-speaking populations (Lee et al., 2010; see Appendices D and E). Validation of *SAHL-S&E* involved testing and comparing the instrument with other health literacy instruments in a sample of 201 Spanish-speaking and 202 English-speaking subjects recruited from the Ambulatory Care Center at the University of North Carolina Healthcare System (Lee et al., 2010). The tool is available under the public domain for use without permission. The *Short Assessment of Health Literacy-Spanish and English (SAHL-S&E)*, combined a word recognition test, as appearing in the *Rapid Estimate of Adult Literacy in Medicine (REALM)* has helped identify individuals with low HL and could be used to screen for low HL among Spanish and English speakers

(Lee et al., 2010). This test contains 18 items and is easy to administer. Examinees are asked to read aloud each of the 18 medical terms and associate each term to another similar in meaning to demonstrate comprehension (Lee et al., 2010). Individuals who score <14 is suggestive that the participant has a low health literacy rate (Lee et al., 2010). The English version, *SAHL-E*, had high correlations with *REALM* ($r = 0.94, p < .05$) and the English *TOFHLA* ($r = 0.68, p < .05$). Significant correlations were found between *SAHL-S&E* and years of schooling in both Spanish and English speaking ($r = 0.15$ and 0.39 , respectively). *SAHL-S&E* displayed satisfactory reliability of 0.80 and 0.89 in the Spanish and English-speaking samples, respectively. IRT analysis indicated that the *SAHL-S&E* score was highly reliable for individuals with a low level of health literacy. The Spanish version of the test, *SAHL-S*, was highly correlated with other Spanish health literacy instruments, *Short Assessment of Health Literacy for Spanish-Speaking Adults* ($r = 0.88, p < .05$) and the Spanish *Test of Functional Health Literacy in Adults (TOFHLA)* ($r = 0.62, p < .05$). A total of 121 research articles have referenced the use of the *SAHL-S&E* tool in their studies (Sarkar, Schillinger, Lopez & Sudore 2010). Permission was granted to use this tool from the Agency for Healthcare Research and Quality (see Appendix H).

The *Michigan Brief Diabetes Knowledge Test* tool was developed by a panel of nationally recognized experts in diabetes education (Fitzgerald et al., 2016). Published initially and validated in 1998, the uses a 14-item test to evaluate general diabetes knowledge and a 9-item test to assess insulin use, but for this study, only the 14-item test was used (see Appendix F and G). This test has been translated into multiple languages,

and it has been found to have generalizability, which is an important aspect when using a tool such as this to determine knowledge related to diabetes (Fitzgerald et al., 2016). The *DKT2* provides a quick and low-cost method of assessing a participants' or a population's general knowledge of diabetes and diabetes self-care. The revised questionnaire is available to clinicians and researchers at no cost. Some questions included in this test focused on (a) the diabetes diet, (b) foods high in carbohydrates, (c) what the best method for testing glucose is, (d) HbA1c should be measured how frequently, (e) what foods can help lower the risk of heart disease are examples of this test that can be helpful when teaching participants with T2DM (see Appendix F). The 23-item test takes approximately 15 minutes to complete. The test's readability was measured by the Flesch-Kincaid grade level. The reading level was calculated at the fourth-grade reading level (Fitzgerald et al., 2016). The psychometric properties provide information regarding the reliability of the various groups of items, as well as a difficulty index (percent of participants who scored this item correctly), and an item to group total correlation for each item (Fitzgerald et al., 2016). Permission to use this tool was granted by Dr. Fitzgerald (Appendix J).

Data Analysis Plan

I conducted one-way repeated measures multivariate analysis of variance (MANOVA) to determine if differences in the dependent variable occur throughout the three-week study period. Analysis of data was completed using the IBM Statistical Package for Social Services (SPSS), 25th edition.

Research Question 1: There will be no effect on blood glucose, health literacy, and medication adherence in older Latina/Hispanic women with T2DM after experiencing an educational intervention.

H₀₁: There will be no effect on blood glucose levels, health literacy, and medication adherence in older Latina/Hispanic women with T2DM after experiencing an educational intervention.

H_{a1}: There will be an effect on blood glucose levels, health literacy, and medication adherence in older Latina/Hispanic women with T2DM after experiencing an educational intervention.

Research Question 2: What effect does an education intervention provided by a healthcare provider have on, health literacy, for Latina/Hispanic women over age 55 with T2DM?

H_{o2}. An education intervention provided by a healthcare provider has no significant effect on health literacy for Latina/Hispanic women over age 55 with T2DM.

H_{a2}. An education intervention provided by a healthcare provider has a significant effect on health literacy for Latina/Hispanic women over age 55 with T2DM.

Research Question 3: An education intervention provided by a healthcare provider has no significant effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

H₀₃. An education intervention provided by a healthcare provider has a significant effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

H_{a3}. An education intervention provided by a healthcare provider has a significant effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

All demographic data and informed consent forms were reviewed for completeness. A one-way repeated measures MANOVA was used to determine whether there was any statistically significant differences between the means of three or more levels of a within-subjects' factors (Pallant, 2013). In using this type of analysis, the participants are the same individuals tested on the same dependent variable over three sessions. A Cronbach's alpha was conducted on the *DKT2* and *BMQI* to test for reliability (see Appendices B and F).

Interpretation of the Results.

The research was conducted to increase knowledge and reduce the gap related to the need to improve health care outcomes for individuals who have low HL and poor medication adherence. The ability to generalize findings is possible with ongoing research that helps to support conclusions, appropriate sample sizes, and the need to use ethically appropriate standards (Creswell, 2013). The setting for significance was set at the $p < 0.5$ level was considered statistically significant per the independent samples *t*-test, with Cronbach's alpha level set at 0.5 and power of 0.80 for each of the questionnaires (Pallant, 2013).

Threats to Validity

Using a quasi-experimental, repeated measures research has its limitations. Polit and Beck (2018) state that quasi-experimental studies are especially susceptible to threats of internal validity. The quasi-experimental study is identical before and after experimental, but weaker because there is no randomization. However, one strength of quasi-experimental research is the pretest, which establishes baseline data of knowledge of the sample (Polit & Beck, 2018).

External validity refers to the generalizability of the research to other settings or populations (Polit & Beck, 2018). The ability to generalize findings was done cautiously since the population of study may not be transferable to a similar population in a different location. The sample used for this study comes from a community health clinic that provides free services to individuals who have no insurance or have insurance that does adequately cover the cost of their care, could limit the generalizability of findings.

Quasi-experimental studies are especially susceptible to threats to internal validity. Threats to internal validity can affect the rigor of the study design. Threats such as history refer to the occurrence of events that place concurrently with the independent variable that can affect the dependent variable (Polit & Beck, 2018). The next threat would be the selection that encompasses biases resulting from the preexisting differences between groups. This will not occur since the study participants needed to meet specific criteria to participate in the research. The third threat is mortality that refers to loss of participants that can occur as data are collected over time and participants are lost from the study. The loss of subjects could occur due to a lack of interest or motivation to

complete the study or if the research period lasts longer than anticipated (Polit & Beck, 2018).. Another threat is the maturation because participants could gain new knowledge and may feel they no longer need to provide follow up glucose levels since they learned to manage their glucose levels.

Construct validity is an overarching term to assess the measurement procedure used to measure a given construct (Houser, 2015). Construct validity incorporates some other forms of efficacy, such as content validity. Thus, as a researcher, construct validity is a process that one goes through to assess the validity of a measurement procedure, while some other forms of validity such as tools assess whether the measurement of the tool helps to measure a given construct (Polit & Beck, 2018). It is important to perform a thorough examination of a measuring instrument to the general framework used to help guide the study (Frankfort-Nachmias et al., 2015).

Ethical Procedures

I applied to the Walden University IRB for permission to conduct my study (approval #11-05-19-0511221). Once permission is received, flyers were posted in the common waiting areas of the clinic, both in English and Spanish. The flyer contains the type and purpose of the study, whom to contact for further questions should they be interested in participating. Participants who expressed interest were informed about the requirements and given the opportunity to withdraw if they so chose at any time. Those participants who agreed and signed both a HIPAA and the Walden IRB informed consent form were enrolled in the study. The form explained the study's purpose, the use of data researched, the confidentiality of the participant, risks, benefits, verification of meeting

criteria and storage of data after completion of the study, and what measures was taken to safeguard the collected data. Both English/Spanish consent forms were provided to all participants at the data collection site. Demographic data were collected using traditional paper-and-pencil.

All participants who participated had their identities protected, and documentation was kept in a locked file cabinet. All participant information was coded using a numbering system, i.e., #1, and so forth that was included in the demographic form. Blood glucose levels reported by the participant so their data were tracked and stored appropriately. Data collected from participants were gathered in a private room that was made available once the study began to collect data. It is essential to protect the participants to make sure that they understand the risk and benefits of the study they have agreed to participate (Polit & Beck, 2018). Copies of documents signed by the participants were provided at the time of signing and it reinforced that anonymity was protected. The educational session was planned to be provided in a group setting in a patient education room. This room can accommodate up to ten individuals at one time and was equipped with a PowerPoint projector, chalkboard, and a large conference table. Educational sessions were planned to be held at three different periods to allow for flexibility of the schedule for the participant.. Participants who completed the study received a \$10.00 gift card thanking them for their participation in the study.

Summary

In summary, this chapter outlined the research design and rationale, the role of the researcher, the study methodology, the data collection process, issues of trustworthiness,

and ethical procedures to be used. The study used the HBM to help gain a deeper understanding of HL, medication adherence, and T2DM and how it affects older Latina women who live with the chronic disease of T2DM.

Current research supports that both HL and medication adherence significantly influences the health of these participants. The goal was that the educational intervention learned the importance that HL and medication adherence to help them manage the T2DM.

In conclusion, this research study had the potential to add to the existing body of knowledge and will provide essential findings regarding how older Latina women cope with their chronic illness and its impact on their daily lives to effect social change. There was little or no research that had been done on this population, so it was my goal to identify and help find ways to help decrease the disparities they encounter compared to their non-White counterparts when low health literacy affects their ability to access health care (Ivano et al., 2015). In Chapter 4, I explained the results of data analysis findings, presented the statistical tests based on the quasi-experimental repeated measures study collected over three different data collection points.

Chapter 4: Results

Introduction

The purpose of this quasi-experimental quantitative repeated-measures study was to determine if the education provided by healthcare providers to Latina/Hispanic women over age 55 diagnosed with T2DM affected their blood glucose level, health literacy, and medication adherence.

The following research question and three related hypotheses formed the basis for this study:

Research Question 1: What effect does an education intervention provided by a healthcare provider have on blood glucose level, health literacy, and medication adherence for Latina/Hispanic women over age 55 with T2DM?

H_o1. An education intervention provided by a healthcare provider has no significant effect on blood glucose levels for Latina/Hispanic women over age 55 with T2DM.

H_a1. An education intervention provided by a healthcare provider has a significant effect on blood glucose levels for Latina/Hispanic women over age 55 with T2DM.

Research Question 2: What effect does an education intervention provided by a healthcare provider have on, health literacy, for Latina/Hispanic women over age 55 with T2DM?

H₀2. An education intervention provided by a healthcare provider has no significant effect on health literacy for Latina/Hispanic women over age 55 with T2DM.

H_a2. An education intervention provided by a healthcare provider has a significant effect on health literacy for Latina/Hispanic women over age 55 with T2DM.

Research Question 3: An education intervention provided by a healthcare provider has no significant effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

H₀3. An education intervention provided by a healthcare provider has a significant effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

H_a3. An education intervention provided by a healthcare provider has a significant effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

Chapter 4 describes how data collection was conducted, summarizes study sample demographics, statistical studies, and hypothesis tested.

Data Collection

Of the 23 respondents, 17 participants that met the inclusion criteria and completed three clinic visits over 3 weeks. Five patients failed to attend one or more weekly visits and were excluded from the study. The study sample included 17 Latina women over age 55, living in a southwestern area of the U.S., and diagnosed with T2DM.

All documentation was submitted to the Walden IRB, and I received the IRB approval (approval #11-05-19-0511221) to begin data collection.

To preserve confidentiality, the participants' were assigned a unique code stored separately from personally identifiable information as a means of matching instrument data with medical record data. I was the only one who had access to the data, which were stored in a locked drawer.

Originally, I had planned to conduct an educational intervention to participants on T2DM. However, during the process of receiving IRB approval from the Walden IRB, I learned that I could not conduct an educational intervention; thus, I opted to change how I would attempt to complete my research study. Therefore, the usual care teaching was administered to participants by nurse practitioners in a clinical setting regarding diet and exercise, disease management literature, and medication adherence. Making these changes to my initial plan was difficult because one of the main cornerstones of being a registered nurse is the provision of education regarding the use of medication teaching to patients and the importance of medication adherence (Texas BON, Title 22, Part II, Chapter 217, Rule §217.11, 2019).

Procedure for Data Collection

First clinic visit. After the participant agreed to be in the study, each participant signed informed consent and scheduled two weekly follow-up appointments. I collected their demographic data which included age, marital status, when they received the diagnosis for T2DM, contact phone number, marital status, number of children, medications taken for diabetes and other chronic diseases, frequency of medical visits

with healthcare providers, and last hospitalization or emergency room visit.

Then each participant completed the following instruments before the educational intervention: (a) *Michigan Diabetes Research and Training Center's Revised Diabetes Knowledge Test (DKT2)*, (b) *Short Assessment of Health Literacy-English (SAHL)* in their primary language, and (c) the *Brief Medication Questionnaire (BMQ)*. I retrieved the results of HbA1c and glucose monitoring retrieved from medical records. The completed teaching session administered by a nurse practitioner related to caring for the participant with T2DM.

During the second and third clinic visits, each participant completed the *DKT2*, *SAHL*, and the *BMQ*. I retrieved the results of HbA1c and glucose monitoring retrieved from medical records. After the third visit, each participant received a gift card for \$10 from Walmart™.

External Validity

Threats to external validity for the study were related to the population from which the participants receive healthcare. Results from this study would need to be compared to future studies in areas with a varied patient population to generalize the findings and make them applicable to other groups (Franfort-Nachmias, Nachmias, & DeWaard,2015). I used convenience sampling to decrease the risk of selection bias in the study to reduce the threat to external validity since I was selecting participants from the research site where permission had been given for this study.

Results

Descriptive Statistics

I used a nonrandom purposive sampling technique to identify and recruit 17 participants. Educational attainment and marital status are displayed in Tables 1 and 2. Five participants (29.4%) completed primary education, seven (41.2%) completed secondary education, and five (29.4%) completed at least some college education. Eight participants (47.1%) were married, six (35.3%) were single or divorced, and three (17.6%) were widowed.

Table 1

Educational Attainment

	<i>n</i>	%
Primary	5	29.4
Secondary	7	41.2
Some College	5	29.4
Total	17	100.0

Table 2

Marital Status

	<i>n</i>	%
Married	8	47.1
Single or Divorce	6	35.3
Widow	3	17.6
Total	17	100.0

Tables 3 and 4 show the primary language spoken by participants and self-reported T2DM knowledge. Ten participants (58.8%) reported English as a primary

language, and seven (41.2%) said Spanish as the primary language. Eight participants (47.1%) indicated *significant* T2DM knowledge, six (35.3%) indicated *some* T2DM knowledge, and three (17.6%) indicated *little* knowledge.

Table 3

Primary Language

	<i>n</i>	%
English	10	58.8
Spanish	7	41.2
Total	17	100.0

Table 4

Diabetes Mellitus- 2 Knowledge

	<i>n</i>	%
Significant	8	47.1
Some	6	35.3
Little	3	17.6
Total	17	100.0

Table 5 shows the mean scores and standard deviation for participants' blood glucose level before the education intervention (pretest), 1 week (posttest 1), and 2 weeks (posttest 2) after the education intervention. Mean blood glucose level pretest equaled 143.29 (*SD*=38.13), posttest 1 equaled 149.47 (*SD*=29.55), and posttest 2 equaled 144.47 (*SD*=34.52).

Table 5

Blood Glucose Level

	Mean	SD
Pretest	143.29	38.13
Posttest 1	149.47	29.55
Posttest 2	144.47	34.52

N=17

Table 6 shows the mean score and standard deviation for participants' Short Assessment of Health Literacy scores before the education intervention (pretest), one week (posttest1), and two weeks after the education intervention. SAHL mean scores pretest equaled 14.47 ($SD=3.10$), posttest 1 equaled 15.11 ($SD=2.97$), and posttest 2 equaled 14.82 ($SD=2.78$).

Table 6

Short Assessment of Health Literacy Scores

	Mean	SD
Pretest	14.47	3.10
Posttest 1	15.11	2.97
Posttest 2	14.82	2.78

Note. *N*=17

Table 7 shows the mean score and standard deviation for participants' Brief Medication Questionnaire scores before the education intervention (pretest), 1 week (posttest1), and 2 weeks after the education intervention. BMQ mean scores pretest

equaled 2.47 ($SD=1.01$), posttest 1 equaled 2.06 ($SD=1.03$), and posttest 2 equaled 2.18 ($SD=1.07$).

Table 7

Brief Medication Questionnaire Scores

	Mean	<i>SD</i>
Pretest	2.47	1.01
Posttest 1	2.06	1.03
Posttest 2	2.18	1.07

$N=17$

Results

Research Question Revised: What effect does a teaching session provided by a healthcare provider have on blood glucose level, health literacy, and medication adherence for Latina/Hispanic women over age 55 with T2DM over time?

H₁₀. A teaching session on blood glucose level and medication by a healthcare provider will have no significant effect on blood glucose levels for Latina/Hispanic women over age 55 with T2DM over time.

H_{a1}. An education intervention provided by a healthcare provider has a significant effect on blood glucose levels for Latina/Hispanic women over age 55 with T2DM.

To test hypotheses 1, I used repeated-measures ANOVA to measure changes in mean blood glucose levels between pretest, posttest 1, and posttest 2 measurements. The assumptions for the repeated measures ANOVA are independent observations, normality, and sphericity. Because each case in the dataset contained data collected from a different

person, the observations may be assumed to be independent. Normality was examined by visual inspection of histograms for each variable (see Figures 2-4). The histograms revealed that the data did not follow a normal bell curve distribution so the assumption of normality was violated. The assumption of sphericity was examined using Mauchly's test. The results of Mauchly's test showed that the data did not meet the assumption because the variances of the differences between all possible pairs of within-subject conditions were equal (sphericity; $p < .05$).

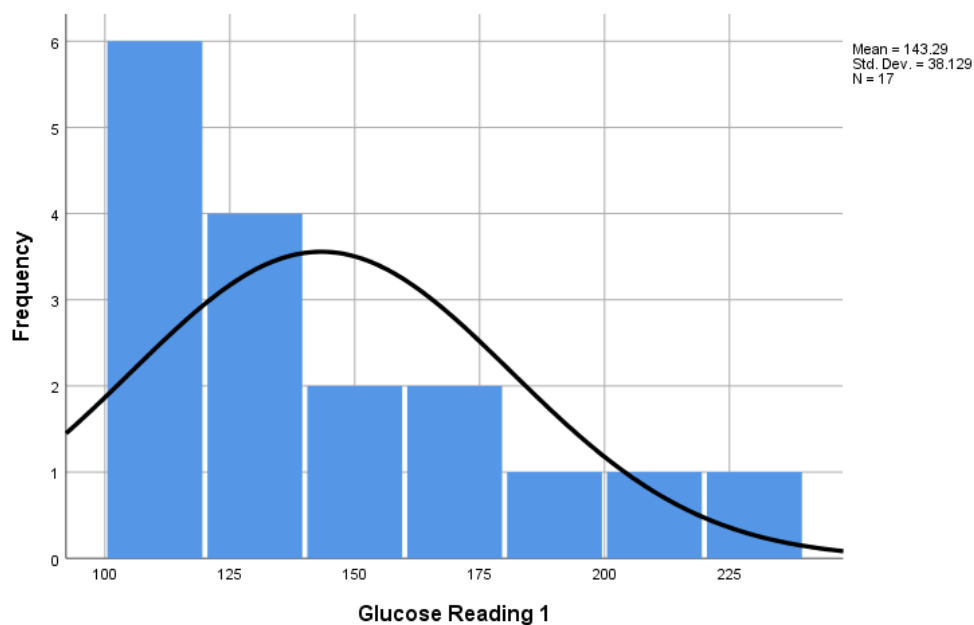


Figure 2. Histogram for pretest glucose levels

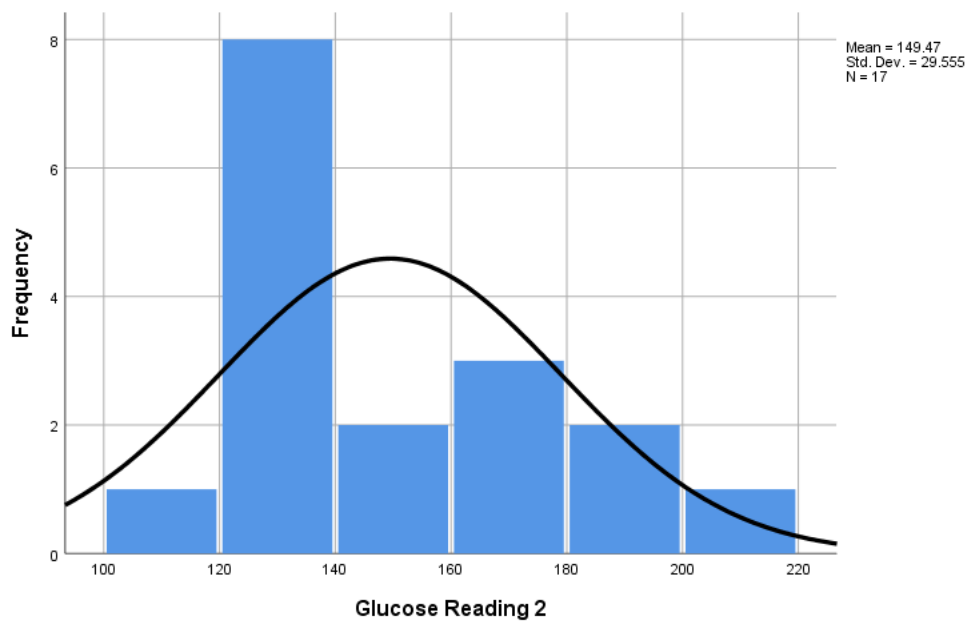


Figure 3. Histogram for posttest 1 glucose levels

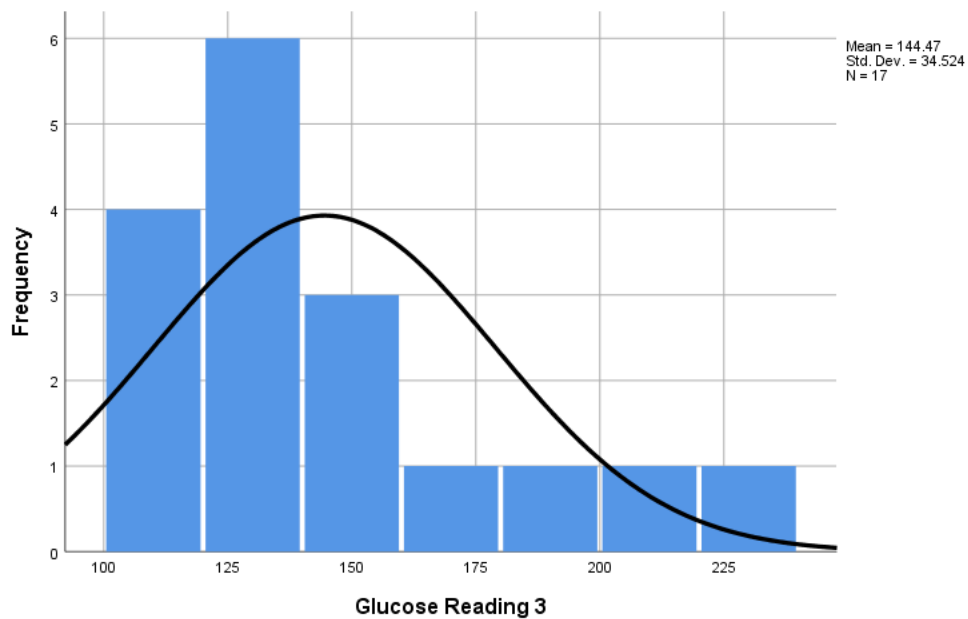


Figure 4. Histogram for posttest 2 glucose levels

Table 8 shows the results from the repeated-measures ANOVA within-subjects' effects. There were no significant differences in mean glucose levels between pretest and posttest 1 or posttest 2 ($F(2) = .296, p = .746$). However, because not all of the assumptions of the ANOVA were met, a nonparametric alternative to the repeated measures ANOVA (i.e., Friedman's test) was conducted. The results of the Friedman's test were not significant, $\chi^2(2) = 3.49, p = .174$. Therefore, the null hypothesis was retained, and the teaching session had no significant effect on the blood glucose level.

Table 8

Repeated-measures ANOVA Within Subjects Effects – Blood Glucose Level

		Type III Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>Sig.</i>
Glucose	Sphericity Assumed	365.68	2	182.84	.296	.746
Error (Glucose)	Sphericity Assumed	19757.64	32	617.42		

Research Question 2: What effect does an education intervention provided by a healthcare provider have on, health literacy, for Latina/Hispanic women over age 55 with T2DM?

H₀2. An education intervention provided by a healthcare provider will have no effect on health literacy for Latina/Hispanic women over age 55 with T2DM.

H_a2. An education intervention provided by a healthcare provider has a significant effect on health literacy for Latina/Hispanic women over age 55 with T2DM.

To test Hypotheses 2, a repeated-measures ANOVA was calculated to measure changes in mean SAHL score between pretest, posttest 1, and posttest 2 measurements. Because each case in the dataset contained data collected from a different person, the observations may be assumed to be independent. Normality was examined by visual inspection of histograms for each variable (see Figures 4-6). The histograms revealed that the data did not follow a normal bell curve distribution, so the assumption of normality was violated. The assumption of sphericity was examined using Mauchly's test. The results of Mauchly's test showed that the data met the assumption that the variances of the differences between all possible pairs of within-subject conditions were equal (sphericity; $p > .05$).

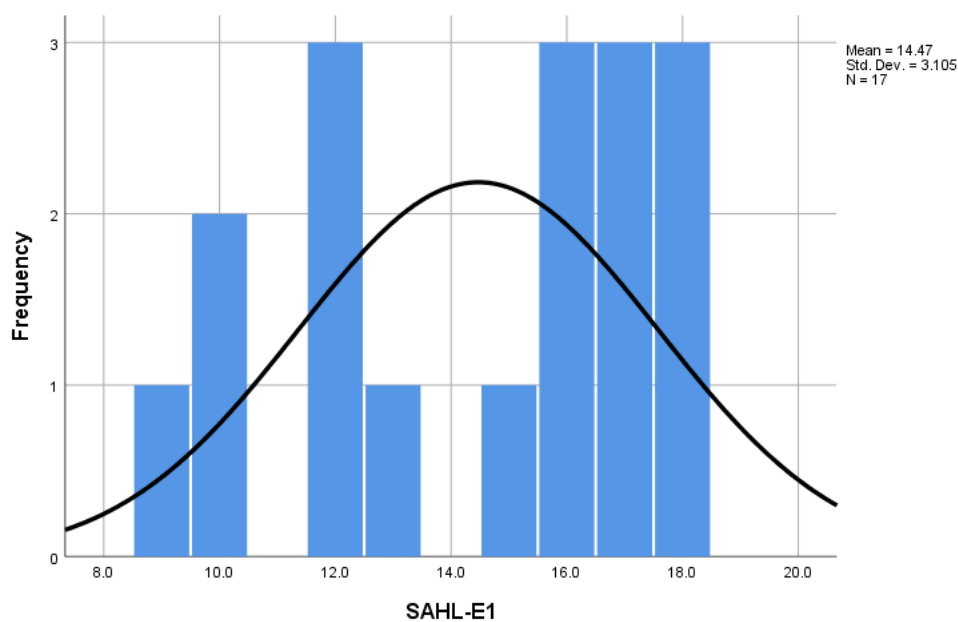


Figure 5. Histogram for pretest SAHL scores

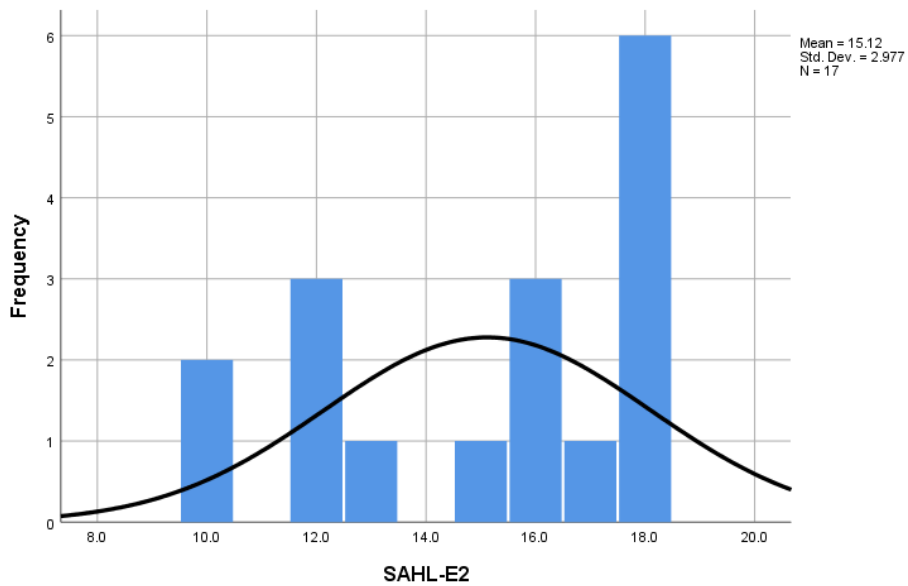


Figure 6. Histogram for posttest 1 SAHL scores

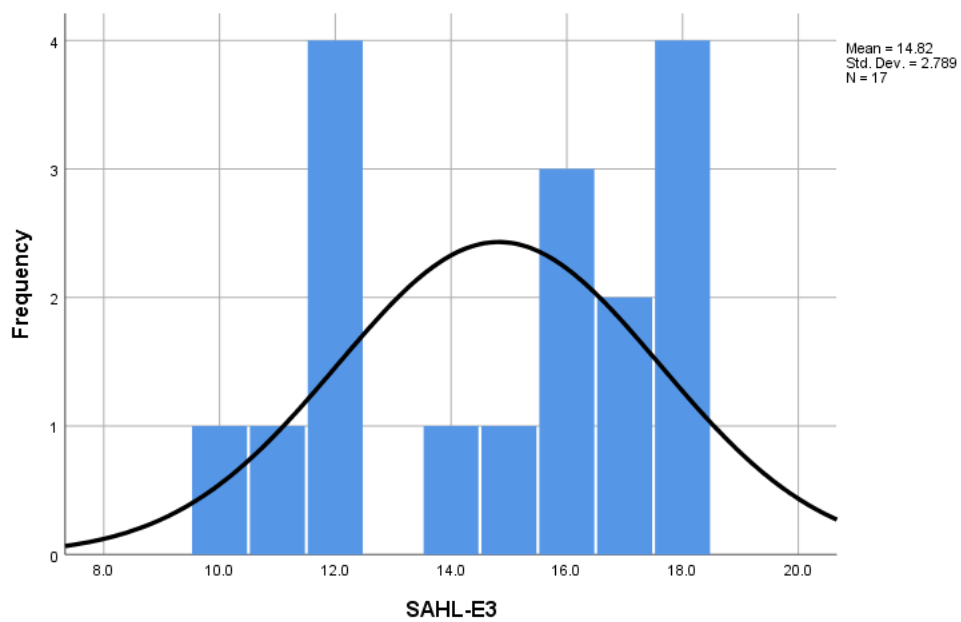


Figure 7. Histogram for posttest 2 SAHL scores

Table 9 shows results from a repeated-measures ANOVA within-subjects' effects.

There were no significant differences in the mean SAHL scores between pretest and posttest 1 or posttest 2 ($F(2) = 1.69, p = .200$). However, because not all of the assumptions of the ANOVA were met, a nonparametric alternative to the repeated measures ANOVA (i.e., Friedman's test) was conducted. The results of the Friedman's test were not significant, $\chi^2(2) = 1.32, p = .518$. Therefore, the null hypothesis was retained and the teaching session had no significant effect on health literacy.

Table 9

Repeated-measures ANOVA Within Subjects Effects – Health Literacy (SAHL score)

		Type III Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>Sig.</i>
SAHL Scores	Sphericity Assumed	3.57	2	1.78	1.69	.200
Error (SAHL)	Sphericity Assumed	33.76	32	1.06		

Research Question 3. An education intervention provided by a healthcare provider will have no effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

H₀₃. An education intervention provided by a healthcare provider has no significant effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

H_{a3}. An education intervention provided by a healthcare provider has a significant effect on medication adherence for Latina/Hispanic women over age 55 with T2DM.

To test Hypotheses 3, I calculated a repeated-measures ANOVA to determine if there were changes in mean BMQ scores between pretest, posttest 1, and posttest two measurements. Because each case in the dataset contained data collected from a different person, the observations may be assumed to be independent. Normality was examined by visual inspection of histograms for each variable (see Figures 8-9). The histograms revealed that the data did not follow a normal bell curve distribution; the assumption of normality was violated. The assumption of sphericity was examined using Mauchly's test. The results of Mauchly's test showed that the data did not meet the assumption that the variances of the differences between all possible pairs of within-subject conditions were equal (sphericity; $p < .05$).

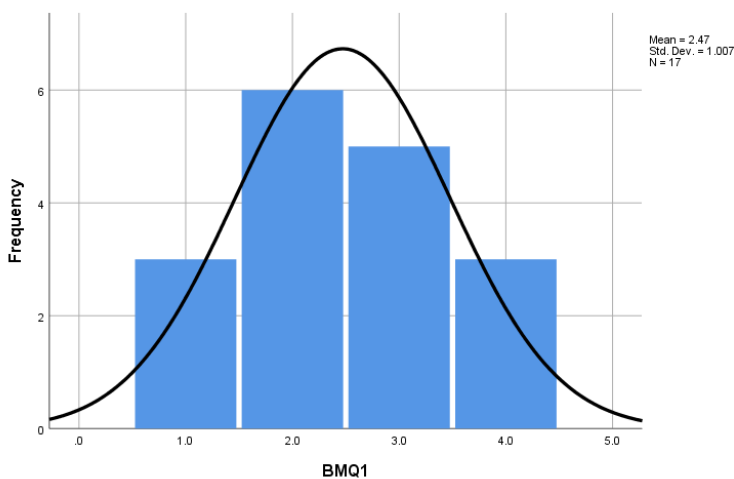


Figure 8. Histogram for pretest BMQ Scores

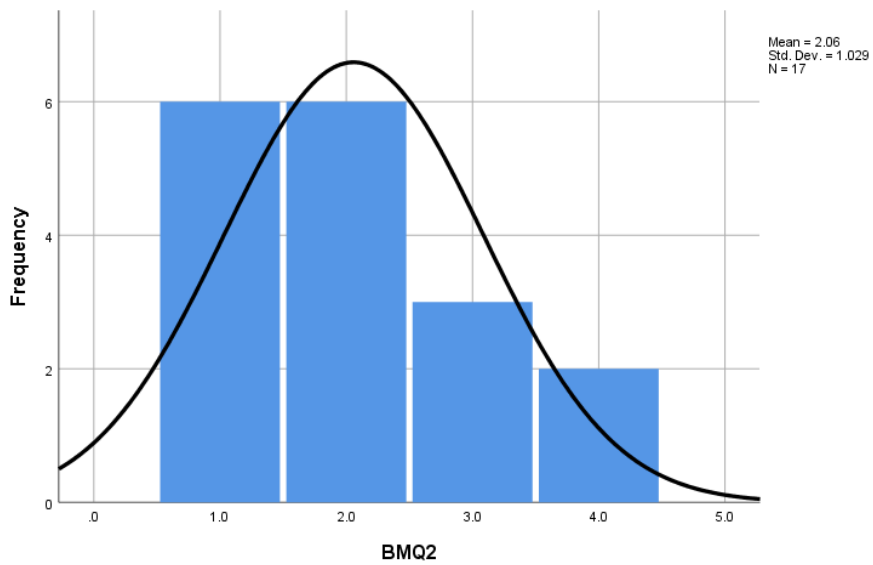


Figure 9. Histogram for posttest 1 BMQ scores

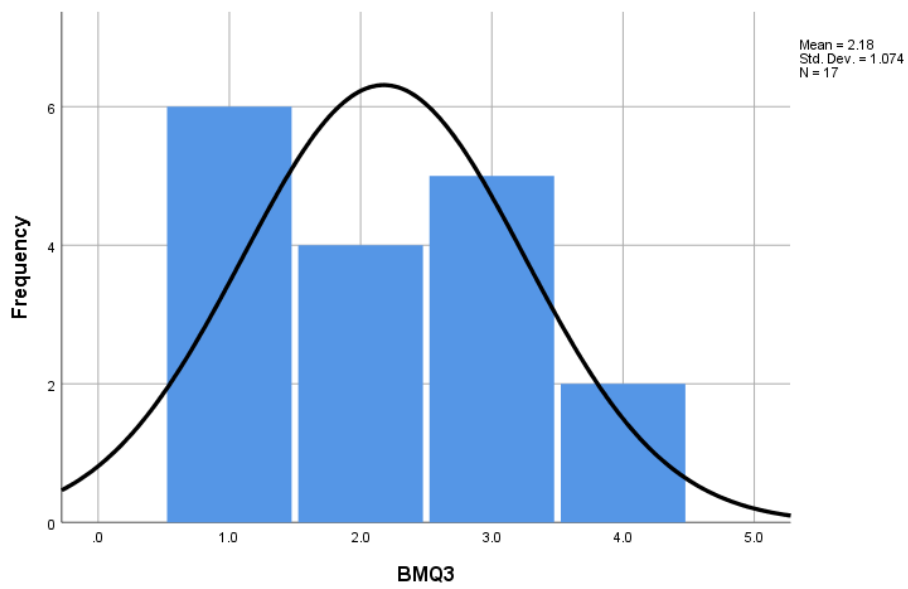


Figure 10. Histogram for posttest 2 BMQ scores

Table 10 shows results from a repeated-measures ANOVA within-subjects' effects. There were no significant differences in mean BMQ scores between pretest and posttest one or posttest 2 ($F(2) = .289, p = .070$). However, because not all the assumptions of the ANOVA were met, a nonparametric alternative to the repeated measures ANOVA (i.e., Friedman's test) was conducted. The results of the Friedman's test were not significant, $\chi^2(2) = 4.32, p = .115$. Therefore, the null hypothesis was retained; the teaching session had no significant effect on medication adherence.

Table 10

Repeated-measures ANOVA Within Subjects Effects – Medication Adherence (BMQ score)

		Type III Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>Sig.</i>
BMQ	Sphericity Assumed	1.528	2	.765	.289	.070
Error (BMQ)	Sphericity Assumed	8.47	32	.265		

Three questionnaires were used to measure different, underlying constructs. The first data collection showed that the BMQ measured a 0.58 Cronbach's alpha, the SAHL measured at 0.71 and the MDKT measures at 0.49. All three instruments were low for level of internal consistency at data point 1.

a. time = 1

Three questionnaires were used to measure different, underlying constructs. The first data collection showed that the BMQ measured a 0.58 Cronbach's alpha, the SAHL

measured at 0.71 and the MDKT measures at 0.49. All three instruments were low for level of internal consistency at data point 1.

The same three questionnaires were used to measure different, underlying constructs. The first data collection showed that the BMQ measured a 0.74 Cronbach's alpha, the SAHL measured at 0.63 and the MDKT measures at 0.54. All three instruments were low for level of internal consistency at data point 2.

The same three questionnaires were used to measure different, underlying constructs. The first data collection showed that the BMQ measured a 0.66 Cronbach's alpha, the SAHL measured at 0.63 and the MDKT measures at 0.6. All three instruments were low for level of internal consistency at data point 3.

The mean represents the average score across the participants (e.g., at Time 1, the average score on the SAHL was 91%). The BMQ is scored from 0-2; the mean score represents the mean across all the items. Cronbach's alpha can range from 0-1; as the score approaches 1 the scale is considered more reliable. In general, a Cronbach's alpha above .7 is considered acceptable in that all items are measuring the same concept. Scores below .7 are considered weak in terms of how much the scale measures a single topic. However, Cronbach's alpha depends on the number of items on the scale; more items correlates to a higher Cronbach's alpha. Additionally, Cronbach's alpha is usually used for Likert-type response scales (e.g., 1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The response scales are correct/incorrect (for SAHL and DKT) or have only three points (0, 1, 2 for the BMQ). The non-Likert response types found in

the MDKT and SAHL-E may have accounted for the lower-than-desired Cronbach's alpha in some of data collected (See Table 11).

Table 11

Summary Table of Cronbach Alpha at three time points

		BMQ	SAHL	DKT
Time 1	Cronbach's alpha	0.58	0.71	0.49
	Mean	0.32	0.91	0.79
	Standard Deviation	0.27	0.10	0.14
	Range	0.00 - .88	.61 – 1.00	.50 – 1.00
Time 2	Cronbach's alpha	0.74	0.63	0.54
	Mean	0.27	0.92	0.76
	Standard Deviation	0.33	0.1	0.15
	Range	0.00 – 1.00	.61 – 1.00	.50 – 1.00
Time 3	Cronbach's alpha	0.66	0.63	0.60
	Mean	0.26	0.89	0.81
	Standard Deviation	0.27	0.11	0.15
	Range	0.00 – 1.00	.56 – 1.00	.57 – 1.00

Summary

Health literacy and medication adherence are essential for patients to be able to manage their health. Health education is important in the management of the disease. The results showed that the teaching session had no significant effect on health literacy, blood glucose, and medication adherence.

In Chapter 5, I present the interpretation of the findings of the study. I discuss the limitations of the study, make recommendations based upon the results and the existing literature, and discuss implications of the study results as they pertain to positive social change, nursing patient education, and the practice of the nursing profession.

Chapter 5 Discussions, Conclusions and Recommendations

Introduction

The purpose of this quasi-experimental quantitative repeated measures study was to determine if the education provided by healthcare providers to Latina/Hispanic women over age 55 diagnosed with T2DM affected their blood glucose level, health literacy, and medication adherence. I conducted this study because it is essential to understand the effect that health education for patients with T2DM had on blood glucose levels, health literacy, and medication adherence. The results showed that the teaching sessions by the nurse practitioners had no significant effect on health literacy, blood glucose, and medication adherence.

Interpretation of Findings

The findings from this study showed that teaching sessions did not have a significant effect on blood glucose levels, health literacy, or medication adherence. The self-management routine for T2DM is one of the most challenging of any chronic illness (Hahn et al. 2015). The results of a systematic review indicated that individuals with lower education or literacy might be especially vulnerable because they are not able to understand and effectively apply educational materials. As demonstrated in this study, had I had the option to perform the education to the participants; there is the possibility that results would have demonstrated a difference, but it did not. Miller's (2016) study demonstrated that health literacy was positively associated with adherence.

Having literacy skills can assist individuals to take medications appropriately or interpret glucose test results from a glucose monitor. Bohanny et al. (2013) identified HL

as being essential for individuals to have the capacity to obtain and process the necessary health information and services to maintain health. Delgado and Ruppap (2017) identified that in culturally diverse populations, HL levels along are not always predictors of people's ability to maintain their health, the systematic review they conducted supports the need to develop evidence-based practice guidelines to help healthcare providers address HL in this population. However, my study showed there were no significant differences in mean SAHL scores between pretest and Posttest 1 or Posttest 2 which did not support the literature on HL.

Studies have shown that individuals with limited HL are more often non-adherent with the medical advice given to them by their healthcare providers (Duggan et al., 2014; Fleischer, Henderson, Wu, Liese & McLain, 2016; Lopez & Golden, 2014). Among older adults, older women are at the highest risk of non-compliance with their health care treatment due to their low health literacy (Cornett, 2009). The literature showed that there is a positive association between medication adherence and glucose control. Medication adherence is a critical component of diabetes treatment to help the patient control their T2DM. De Vries-McClintock, Morales, Small & Bogner, 2016), show that there is a need for teaching sessions to be tailored to the individual to focus on the importance of medication and glucose control. However, the results of my study did not support the literature on the effect of education on the control of T2DM of individuals.

Using the HBM as the framework in this study offered a sound theoretical basis for understanding the behaviors that influenced older Latina women's beliefs related to T2DM, and the impact HL has when dealing with chronic disease. The HBM has been

used in Latina women's health practices and is one of the most predominant models in nursing practice (Garcia, 2016), and it was one of the first theories used in the study of health behaviors. The HBM model was supported by my study because participants in this study sought opportunities to help them manage their T2DM.

Limitations of the Study

The study had several limitations. The first one was that I could not conduct the study as I had planned. Instead, the study changed its focus to have the nurse practitioners at the research site provide the education to the patient as they were seen rather than the planned educational intervention. Each nurse practitioner documented their education provided to patients in the electronic medical record. The length of time used to provide education was not available and incorporated into the visit time with the nurse practitioner.

The study participants were recruited from the research site, which is a healthcare clinic that provides care to individuals who have no health insurance or were underinsured. While only women were recruited for this study, the sample size was small, since the clinic had a smaller number of eligible patients who could meet the criteria for the study. A total of 30 women met the criteria for inclusion.

One other limitation of my quasi-experimental design was the lack of randomization (Polit & Beck, 2018). Since I used convenience sampling, it limited the generalizability of the findings. Lastly, time constraints could occur when attempting to obtain information from the participants due to the lack of HL, or their ability to read instructions given to them when trying to administer related test instruments which will

be used to measure their lack of knowledge or show improvement. Since I used a quasi-experimental repeated measures design, there are limitations such as the threat to internal validity; and this could be due to bias (Polit & Beck, 2018). This could occur because the study participants completed data collection tools over three weeks. As a result, the participants gained comfort with being exposed to the same collection tools, which possibly led to bias. Consequently, the individuals in this study did better over the three weeks while the study was being conducted.

Recommendations

The study results indicated that there was no significance found from the educational intervention provided by the nurse practitioners, on blood glucose, health literacy, or medication adherence. Therefore, further study is needed to identify additional variables as predictors, such as financial need, the importance of keeping medical appointments, and participation in a structured diabetes education program where participants can attend formal education classes on T2DM with classes provided both in English and Spanish (Valencia et al., 2015).

I would also recommend the inclusion of male participants to be studied separately from women with T2DM. Prada, Horton, Cherrington, Ibarra, and Ayala (2012) suggested that studies related to adherence are needed on men to address medication, and self-care benefits amongst this group their education class would focus on diet, medication, and self-care risk factors since many of the men work as laborers and are at risk for injury. Gender can be a strong predictor of medication nonadherence among Latinos with T2DM (Prada et al. 2012). I would also recommend that a study to

determine the effect of a specific, targeted educational interventions be conducted on individuals with T2DM using a specific educational intervention that covers topics on T2DM over an extended time.

Implications to Social Change

Diabetes mellitus continues to be an escalating global health threat; it has more than doubled among adults over the past 3 decades (McEwen, Pasvogel, Murdaught, & Hepworth, 2017). At least 45% of participants with T2DM failed to achieve adequate glycemic control, such as an HbA1c of less than 7%. While approximately 50% of participants do not take medications as prescribed, Latina women are at high risk not only with attempting to control their diabetes, but they also have a poor medication adherence and have low literacy rates (Brown & Bussell, 2011; Ontiniano et al., 2012).

Latinos/Hispanics experience higher rates of obesity, sedentary lifestyles, poor eating habits, and family histories of diabetes, diabetes-related death rates, and thus, helping to educate these individuals is crucial to achieving positive healthcare outcomes. Nurses advocating for their patients to learn from patient teaching is essential for their health and wellbeing. Diabetes requires that not only the patient, but the family support the diabetic patient. Without this support, patients feel alone and isolated (Strom & Egede, 2012).

There remains a need to continue finding ways to educate patients about this disease. One way is to educate patients about T2DM is to explore the use of one on one educational opportunities as well as making that there support system understand why medication adherence, doing daily glucose checks, and keeping medical appointments are essential if a change is to occur in this population. My study showed that it has the potential for

social change by providing and developing educational sessions to help patients better understand their disease process. Education is the key that will empower the participants to manage their care and improve their outcome. People with T2DM could influence social change in the community and clinic as they learn to overcome self-care barriers, medication adherence, to improve long-term care for these women in the future.

Conclusion

Health literacy and medication adherence are essential for patients to be able to manage their health. Health education for patients to learn the importance of management of the disease is necessary. My study results did not show no significant effect between medication adherence and patient education over time. The HBM theory posits that behavior is dependent upon two variables (a) that an individual has a goal to attain, and (b) is the likelihood that the individual can achieve the goal. Diabetes self-management is crucial to maintaining the quality of life and preventing long-term complications seen with this disease (Wiebe, Helgeson, & Berg, 2016).

Individuals who have low literacy has been associated with many health outcomes, including poor health status among older adults, less diabetes-related knowledge, and increase hospitalized risk (Sentell, Pitt, Buchthal, 2014; Bailey et al., 2014; Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011). Improving health literacy outcomes can help in improving overall health; without it, individuals like those in my study will continue to struggle with not having positive healthcare outcomes.

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Appendix A: Diabetes Educational Intervention

- I. Welcome
- II. Introduction of Educator
 - a. Overview of Intervention
 - b. Have participants introduce themselves
- III. Diabetes and how it affects your body?
 - a. Information over diabetes and how it affects the body
 - b. Understanding Diabetes
 - c. Diabetes and Cardiovascular Risk
 - d. Get Support.
- IV. How many types of diabetes are there?
 - a. Type I
 - b. Type II
 - c. Gestational Diabetes
- V. Who can develop T2DM?
 - a. Genetics
 - b. Ethnicity
 - c. Obesity
- VI. Monitor your Blood Glucose
 - a. Checking Blood Glucose using a monitor
 - b. Value of logging your blood glucose results daily
 - c. How the A1C test helps

- d. Treating High and Low Blood Glucose Levels

VII. Taking Medications

- a. Managing your Medications
- b. Why you must take your medications as prescribed

VIII. Nutrition and Diet

- a. Setting eating goals on a budget
- b. How carbohydrates affect blood glucose
- c. Planning your meals
- d. Eating away from home

IX. Foot Care

- a. Daily feet inspection using a mirror to examine feet
- c. Washing feet daily
- d. Use of lotions to help keep moist skin
- e. Why it's important to wear shoes

X. Sick Day Rules

- a. The importance of monitoring blood glucose when sick
- b. The importance of eating when ill
- c. The importance of when to call your physician.

XI. Questions/Answers

XII. Review of topics covered

Appendix B: The Brief Medication Questionnaire (BMQ 1)

1. Please list below all medications you took in the **PAST WEEK**. For each medication you list, please answer each of the questions in the boxes below. [Use additional page if necessary]

a. Medication name	b. How many days did you take it?	c. How many times per day did you take it?	d. How much did you take each time?	e. How many times did you miss taking it?	f. For what reason were you taking it?	g. How well does this medicine work for you? 1= very 2= somewhat 3= not at all 4= don't know

2. Do any of your medications bother you in any way? (Check one) YES [] NO []
 a. IF YES, please name the medication and explain how it bothers you.

Medication Name	In what way does it bother you?

3. How much problem or concern are you having in the following areas [circle one]
- | | <u>None</u> | <u>A little</u> | <u>A lot</u> |
|--|-------------|-----------------|--------------|
| a. My medication causes side effects. | 0 | 1 | 2 |
| b. It is hard to remember all the doses | 0 | 1 | 2 |
| c. It is hard to pay for the medication | 0 | 1 | 2 |
| d. It is hard to open the container. | 0 | 1 | 2 |
| e. It is hard to get my refill on time. | 0 | 1 | 2 |
| f. It is hard to read the print on the container | 0 | 1 | 2 |
| g. The dosage times are inconvenient | 0 | 1 | 2 |
| h. My medication causes other problem or concern | 0 | 1 | 2 |

If other problem or concern, please explain:

4. Did you stop taking any medications in the **PAST SIX MONTHS**? (Check one) YES [] NO []
 If yes, please list the medications you stopped. For each, answer the questions in the boxes below.

a. Medication name	b. For what reason were you taking it?	c. How well did the medicine work for you? 1= very 2= somewhat 3= not at all 4= don't know	d. How much did it bother you? 0 = none 1= a little 2= a lot	e. For what reason did you stop taking it?

Appendix C: Brief Medication Questionnaire (BMQ) – Spanish Version

1. Por favor enumere debajo de todos los medicamentos que tomó en la semana pasada. Por cada medicamento que Enumere, responda a cada una de las preguntas de las siguientes casillas. [Utilice la página adicional si es necesario).

Nombre del medicamento	¿Cuántos días lo llevaste?	¿Cuántas veces al día lo tomas?	¿Cuánto te tomas cada vez?	¿Cuántas veces te lo has perdido?	¿Por qué razón lo estabas tomando?	¿Qué tan bien funciona este medicamento para usted? 1 = muy 2 = un poco 3 = no en absoluto 4 = no sé

2. ¿Alguno de tus medicamentos te molesta de alguna manera? (Marque uno) Si [] No []
En caso afirmativo, por favor nombra el medicamento y explícale cómo te molesta.

Nombre del medicamento	¿De qué manera te molesta?

3. ¿Cuánto problema o preocupación está teniendo en las siguientes áreas [circule uno]
- | | Ninguno | Un poco | Mucho |
|--|---------|---------|-------|
| a. Mi medicación causa efectos secundarios | 0 | 1 | 2 |
| b. es difícil recordar todas las dosis | 0 | 1 | 2 |
| c. es difícil pagar por la medicación..... | 0 | 1 | 2 |
| d. es difícil abrir el recipiente..... | 0 | 1 | 2 |
| e. es difícil conseguir mi recarga a tiempo..... | 0 | 1 | 2 |
| f. es difícil leer la impresión en el envase | 0 | 1 | 2 |
| g. los tiempos de dosificación son inconvenientes..... | 0 | 1 | 2 |
| h. mi medicación causa otro problema o preocupación... | 0 | 1 | 2 |
- Si otro problema o inquietud, por favor explique:
-

4. ¿Dejas de tomar algún medicamento en los últimos seis meses? (Marque uno)

Sí [] No []

En caso afirmativo, por favor enumere los medicamentos que detuvo. Para cada una, responda a las preguntas de las siguientes casillas.

a. Nombre del medicamento	b. Por qué razón lo estabas tomando?	c. ¿Qué tan bien funcionó la medicina para usted? 1 = muy 2 = un poco 3 = no en absoluto 4 = no sé	d. ¿Cuánto te molestó? 0 = Ninguno 1 =Un poco 2 = Mucho	e. ¿Por qué lo dejaste de tomar?

Appendix D: Instructions for Administering SAHL-E

SHORT ASSESSMENT OF HEALTH LITERACY-ENGLISH (SAHL-E)**Interviewer's Instruction**

The *Short Assessment of Health Literacy-English*, or *SAHL-E*, contains 18 test items designed to assess an English-speaking adult's ability to read and understand common medical terms.

Stem	Key or Distracter		
1. kidney	__urine	__fever	__don't know
2. occupation	__work	__education	__don't know
3. medication	__instrument	__treatment	__don't know
4. nutrition	__healthy	__soda	__don't know
5. miscarriage	__loss	__marriage	__don't know
6. infection	__plant	__virus	__don't know
7. alcoholism	__addiction	__recreation	__don't know
8. pregnancy	__birth	__childhood	__don't know
9. seizure	__dizzy	__calm	__don't know
10. dose	__sleep	__amount	__don't know
11. hormones	__growth	__harmony	__don't know
12. abnormal	__different	__similar	__don't know
13. directed	__instruction	__decision	__don't know
14. nerves	__bored	__anxiety	__don't know
15. constipation	__blocked	__loose	__don't know

16. diagnosis	__evaluation	__recovery	__don't know
17. hemorrhoids	__veins	__heart	__don't know
18. syphilis	__contraception	__condom	__don't know

Appendix E: Short Assessment of Health Literacy-Spanish (SAHL-S)

Primero, me gustaría que usted lea la palabra. Entonces, yo leeré las dos palabras debajo a usted y me gustaría que usted dijera cual de las dos palabras es mas similar a la palabra arriba. Si usted n sabe las respuestas, por favor diga, “no sé”. No advine.”

Stem	Key or Distracter		
1. empleo	__trabajo	__educación	__no se
2. convulsiones	__mareado	__tranquilo	__no se
3. infección	__mata	__virus	__no se
4. medicamento	__instrumento	tratamiento	__no se
5. alcoholismo	__adicción	__recreo	__no se
6. riñón	__orina	__fiebre	__no se
7. dosis	__dormir	__cantidad	__no se
8. aborto espontáneo	__pérdida	matrimonio	__no se
9. estreñimiento	__bloqueado	__suelto	__no se
10. embarazo	__parto	__niñez	__no se
11. nervios	__aburrido	__ansiedad	__no se
12. nutrición	__saludable	__gaseosa	__no se
13. indicado	__instrucción	__decisión	__no se
14. hormonas	__crecimiento	__harmonía	__no se
15. abnormal	__diferente	__similar	__no se
16. diagnóstico	__evaluación	recuperación	__no se

17. hemorroides	__venas	__corazón	__no se
18. sífilis	__anticonceptivo	__condón	__no se

Appendix F: Michigan Diabetes Research and Training Center's Revised Diabetes

Knowledge Test (DKT2)

1. The diabetes diet is:
 - a. the way most American people eat.
 - b. health diet for most people.*
 - c. too high in carbohydrate for most people.
 - d. too high in protein for most people.

2. Which of the following is highest in carbohydrate?
 - a. Baked chicken
 - b. Swiss cheese
 - c. Baked potato*
 - d. Peanut butter

3. Which of the following is highest in fat?
 - a. Low fat (2%) milk*
 - b. Orange juice
 - c. Corn
 - d. Honey

4. Which of the following is a "free food"?
 - a. Any unsweetened food
 - b. Any food that has "fat free" on the label
 - c. Any food that has "sugar free" on the label
 - d. Any food that has less than 20 calories per serving. *

5. A1C is a measure of your average blood glucose level for the past:
 - a. day
 - b. week
 - c. 6 – 12 weeks*
 - d. 6 months

6. Which is the best method for home glucose testing?

- a. Urine testing
 - b. Blood testing *
 - c. Both are equally good
7. What effect does unsweetened fruit juice have on blood glucose?
- a. Lowers it.
 - b. Raises it*
 - c. Has not effect
8. Which should not be used to treat a low blood glucose?
- a. 3 hard candies
 - b. ½ cup orange juice
 - c. 1 cup diet soft drink*
 - d. 1 cup skim milk
9. For a person in good control, what effect does exercise have a blood glucose?
- a. Lowers it*
 - b. Raises it
 - c. Has not effect
10. What effect will an infection most likely have on blood gluoce?
- a. Lowers it
 - b. Raises it*
 - c. Has not effect
11. The best way to take care of your feet is to:
- a. look at and wash them each day*
 - b. massage them with alcohol each day
 - c. soak them for one hour each day
 - d. buy soes a size larger
12. Eating food lower in fat decreases your risk for
- a. nerve disease
 - b. kidney disease
 - c. heart disease*
 - d. eye disease
13. Numbness and tingling may be symptoms of:

- a. kidney disease
- b. nerve disease*
- c. eye disease
- d. liver disease

14. Which of the follow is usually not associate with diabetes:

- a. vision problems
- b. kidney problems
- c. nerve problems
- d. lung problems*

* Correct answer

Note: For non-US patient populations, we recommend reviewing the terms used in items 1, 2, 3, 4 and 8 for appropriateness.

RevDKT; Diabetes Research and Training Center
© University of Michigan, 2015

Appendix G: Michigan Diabetes Research and Training Center's Revised Diabetes

Knowledge Test (DKT2) Spanish Version

1. La dieta para la diabetes es:
 - a. la forma en que la mayoría de la gente americana come.
 - b. dieta de salud para la mayoría de las personas. *
 - c. demasiado alto en carbohidratos para la mayoría de las personas.
 - d. demasiado alto en proteínas para la mayoría de las personas
2. ¿Cuál de las siguientes es la más alta en cabohyrate?
 - a. pollo al horno
 - b. queso suizo
 - c. patata al horno*
 - d. mantequilla de cacahuete
3. ¿Cuál de las siguientes es la más alta en grasa?
 - a. leche grasa baja (2%) *
 - b. jugo de naranja
 - c. maíz
 - d. miel
4. ¿Cuál de los siguientes es un "alimento libre"?
 - a. cualquier alimento sin endulzar
 - b. cualquier alimento que tenga "grasa libre" en la etiqueta
 - c. cualquier alimento que tenga "azúcar libre" en la etiqueta
 - d. cualquier alimento que tenga menos de 20 calorías por porción. *
5. La hemoglobina A1C es una medida de su nivel medio de glucosa en sangre para el pasado.
 - a. Por un día
 - b. Una semana
 - c. De 6 a 12 semanas*
 - d. De 6 meses
6. ¿Cuál es el mejor método para la prueba de glucosa casera?
 - a. Usando una prueba de orina
 - b. Análisis de sangre *
 - c. Ambos son igualmente buenos
7. ¿Qué efecto tiene el jugo de fruta sin endulzar en la glucosa sanguínea?
 - a. Lo bajo
 - b. Lo eleva*
 - c. No tiene efecto
8. ¿Qué no se debe usar para tratar un nivel bajo de glucosa en sangre?
 - a. Caramelos duros
 - b. 1 taza de refresco de dieta *
 - c. 1 taza de leche desnatada

9. Para una persona en buen control, ¿qué efecto tiene el ejercicio de glucosa en la sangre?
 - a. Lo baja*
 - b. Lo eleva
 - c. No tiene efecto
10. ¿Qué efecto tendrá probablemente una infección en la glucosa en sangre?
 - a. Disminuye
 - b. Lo eleva*
 - c. No tiene efecto
11. La mejor manera de cuidar sus pies es:
 - a. Verlos y lavarlos cada día*
 - b. Masajear con alcohol cada día
 - c. Remojar durante una hora al día.
 - d. Comprar propiedad estatal un tamaño mayor.
12. Consumir alimentos con menor contenido de grasa disminuye el riesgo de
 - a. una enfermedad nerviosa
 - b. enfermedad renal
 - c. cardiopatía *
 - d. enfermedad ocular
13. El entumecimiento y el hormigueo pueden ser síntomas de:
 - a. Enfermedad renal
 - b. Enfermedad nerviosa
 - c. Enfermedad ocular
 - d. Enfermedad hepática
- 14.Cuál de los siguientes no suele asociarse con la diabetes
 - a. Problemas de visión.
 - b. Problemas renales
 - c. Problemas nerviosos
 - d. Problemas pulmonares**

Appendix H: AHRQ Permission Letter to use the SAHL-S&E Tool

Dear Ms. Trinidad:

This email constitutes formal permission from the Agency for Healthcare Research and Quality (AHRQ) to you for use of the Short Assessment of Health Literacy-Spanish & -English (SAHL- S&E) in your doctoral project for Walden University. You may make copies of the questionnaires for use in your study, and copies of the guide for administering and scoring the questionnaires. These items are available on the AHRQ Web site (<https://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy/index.html#short>). You may reprint the questionnaires in your thesis/project paper as long as you note the source. However, if you subsequently want to reprint these materials in a journal article about your project, the journal's publisher will need to get copyright permission from AHRQ.

The Short Assessment of Health Literacy-Spanish and English (SAHL-S&E) in: Health Literacy Measurement Tools (Revised). Content last reviewed February 2016. Agency for Healthcare Research and Quality, Rockville, MD.
<http://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy/index.html>

You probably also want to cite the validation study for these tools:

Lee S.-Y. D., Stucky B.D., Lee J. Y. et al. Short assessment of health literacy-Spanish and English: A comparable test of health literacy for Spanish and English speakers HSR 2010 August;45(4):1105-20. Pub Med ID (PMID): 20500222 [Full text available in PubMed Central at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2910571/>]

Do not hesitate to contact me if you have additional questions or need this permission in the form of a signed letter on AHRQ letterhead.

Thank you for your patience.

Sincerely,

David I. Lewin, M.Phil.
Health Communications Specialist/Manager of Copyrights &
Permissions Office of Communications
Agency for Healthcare Research and Quality, 5600 Fisher Lane, Rockville, MD

Appendix I: Permission from Bonnie Svarstad, Ph.D., Research for BMQ1

Bonnie Svarstad bonnie.svarstad@wisc.edu

Re: Permission to use Brief Medication Questionnaire 1

You now have permission to use BMQ per email agreement. Good luck w study. Bonnie Svarstad

On Oct 22, 2018, at 7:31 PM, cecilia trinidad <trinidadcst@outlook.com> wrote:

I will you items as written when using the Brief Medication Questionnaire 1

Cecilia S. Trinidad, MSN, RN
 Doctoral Student – Walden University
Cecilia.trinidad@waldenu.edu
trinidadcst@outlook.com

From: Bonnie Svarstad <bonnie.svarstad@wisc.edu>

Sent: Sunday, October 21, 2018 3:06 PM

To: cecilia trinidad <trinidadcst@outlook.com>

Subject: Re: Permission to use Brief Medication Questionnaire 1

Please add that you will use items as written.

On Oct 21, 2018, at 11:36 AM, cecilia trinidad <trinidadcst@outlook.com> wrote:

Dear Dr. Svarstad

Thank you so much for your reply to my request to use the Brief Medication Questionnaire (BMQ).

As requested here is the reply to the information you requested that I reply to in your email.

1. Title of my dissertation ““The effect of Health Literacy on Medication Adherence in Older Latina Women with Type 2 Diabetes Mellitus.”
2. Date of Proposed Study or Clinical Use: November 1, 2018 to June 30, 2019.
3. Properly footnote our 1999 copyright: Yes I will cite your work both in my dissertation as well as in any all published work that could result from this research to retain the validity of the BMQ.
4. I will not sell, publish, or transfer the BMQ or my translations of it to insure the copyright of this work.

My faculty chair or advisory for my dissertation is Leslie C. Hussey, Ph.D., R.N., CNE, Walden University, leslie.hussey@waldenu.edu. She has been notified that I have provided your name as requested.

Thank you so much for allowing me to use this tool.

Respectfully,

Cecilia S. Trinidad, MSN, RN
Doctoral Student – Walden University
Cecilia.trinidad@waldenu.edu
trinidadcst@outlook.com

From: Bonnie Svarstad <bonnie.svarstad@wisc.edu>
Sent: Saturday, October 6, 2018 4:59 PM
To: cecilia trinidad <trinidadcst@outlook.com>
Cc: Bonnie Svarstad <bonnie.svarstad@wisc.edu>
Subject: RE: Permission to use Brief Medication Questionnaire 1

Dear colleague:

Thanks for your interest in the Brief Medication Questionnaire (BMQ).

If you wish to use the BMQ, please send an email stating the title and dates of proposed study or clinical use. Also, please state that you will: 1) properly footnote our 1999 copyright on your tools; 2) properly cite our 1999 article in all reports/publications; 3) use the items as they are written (to avoid confusion and retain validity of the BMQ); and 4) not sell, publish, or transfer the BMQ or your translations of it (to preserve our copyright).

Also, please xc (copy) and provide the full title, and contact information of your faculty advisor.

For your information, I'm attaching the original BMQ and Instructions for Coding. There is no charge for using the BMQ if you receive my written permission and use it as agreed. Thanks again for interest in the BMQ.

Bonnie Svarstad, PhD, Professor Emerita
UW-Madison School of Pharmacy, Madison WI
email: bonnie.svarstad@wisc.edu

From: cecilia trinidad [<mailto:trinidadcst@outlook.com>]
Sent: Saturday, September 22, 2018 2:43 PM
To: Bonnie Svarstad <bonnie.svarstad@wisc.edu>
Subject: Permission to use Brief Medication Questionnaire 1

I am a doctoral student at Walden University working on my PhD in Nursing Education. I am writing to ask for permission to use Brief Medication Questionnaire 1 (BMQ 1) . The title of my dissertation is “The effect of Health Literacy on Medication Adherence in Older Latina Women with Type 2 Diabetes Mellitus.” I would like to use your tool to help me measure the participant’s self-reported level of medication adherence. I feel that it will provide me with the data needed to strengthen my findings when working with this population and has shown good validity and reliability with minority patients with different chronic diseases.

I am now approaching the methodology section of my dissertation and hope that you will grant me permission to use this tool and provide me what it would cost to obtain a license to use this test in my research project. Should you wish to speak with me directly, you are most welcome to contact via my cell number which is 1-830-560-0380 or contact via email through my Walden email which is cecilia.trinidad@waldenu.edu.

Appendix J: Permission from James T. Fitzgerald, Ph.D., Research for the Michigan

DKT2

Ms. Trinidad,

You have my permission to use the test. I have attached a revise version. If you have any questions, please contact me. Good luck with your study.

James T. Fitzgerald, PhD

Professor

Department of Learning Health Sciences

217 Victor Vaughn Building

1111 E. Catherine Street

Ann Arbor, MI 48109-2054

ph:734-936-1644 fax:734-936-1641

Associate Director

Education and Evaluation

GRECC

Ann Arbor Medical Center (11G)

2215 Fuller Road

Ann Arbor, MI 48105-2300

ph:734-845-3047 fax:734-845-3298

tfitz@med.umich.edu

On Sep 29, 2018, at 11:27 AM, cecilia trinidad <trinidadcst@outlook.com> wrote:

CAUTION: This email originated outside the University of Michigan
DO NOT click links or open attachments if the sender is unknown to you.

Dr. Fitzgerald,

My name is Cecilia Trinidad and I am a PhD student at Walden University. My program is a Doctor of Philosophy with a concentration in Nursing Education. Currently, I work as a Nurse Educator and Nurse Practitioner. I am currently in the dissertation stage of my program and my dissertation is titled; Effect of Health Literacy on Medication Adherence in Older Latina Women with Type 2 Diabetes Mellitus. I would like to use your tool to help me measure the participant's self-reported level of medication adherence. I feel that it will provide me with the data needed to strengthen my findings when working with this population and has shown good validity and reliability. I would be most appreciated regarding any suggestions related to the use of this instrument.

Should you wish to speak with me directly, you are most welcome to contact via my cell number which is 1-830- or contact via email through my Walden email which is cecilia.trinidad@waldenu.edu or trinidadcst@outlook.com.

Thanking you in advance for the opportunity to use your instrument in my study,

Respectfully,
Cecilia S. Trinidad, MSN, APRN
PhD Candidate – Walden University

