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Sociodemographic Predictors of Medication Nonadherence Among Latinos Diagnosed with Diabetes Type II

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Abstract

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Dissertation Submitted in Partial Fulfillment

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Public Health Epidemiology

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Abstract

Latinos of low socioeconomic status are disproportionately affected by diabetes Type II complicated by poor adherence to diabetes Type II medications and management programs. Self-management of diabetes Type II is a tool used to teach health education to patients with diabetes. The objective of this retrospective quantitative study was to explore if there are predictors of nonadherence to diabetes Type II medications and programs among Latinos with diabetes Type II. Data from 200 patient records from a community clinic in Fresno County California were analyzed using both bivariate and multivariate analysis. Selected sociodemographic independent variables were age, gender, income, migrant worker status, family size, and having received health education. The dependent variable was adherence to medication and management programs. Gender and health education were the only strong predictors of nonadherence to diabetes Type II medications and programs among the study sample in the bivariate analysis. The combination of gender and health education was the only strong predictor to diabetes Type II medications and programs in the multivariate analysis. Recommendations include personalized health education that incorporates a protocol for teaching patients about diet, consumption of alcoholic beverages, exercise, medication, and the effects these behaviors have on diabetes prevention and management. The implications for positive change include decreasing complications, improving quality of life, and improving patient satisfaction. The implications also include decreasing health care cost for stakeholders, including patients, and insurance payers.

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Dedication

This dissertation is dedicated to:

My family: Angelita Crystal Zechman, Yvette Marie Tristan-Paul, Joseph P. Tristan Jr., and Joseph P. Tristan Sr. for their support, assistance, and encouragement during the writing of this dissertation. This has been a long journey that required their patience and understanding.

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Table of Contents

Chapter 1: Introduction to the Study....1

Background....2

Problem Statement....5

Purpose of the Study....7

Research Question and Hypotheses....7

Multivariate Analysis....9

Theoretical Framework....10

The Social Cognitive Theory.... 10

Self-Determinant Theory.... 11

Foundation for the Study.... 12

Conceptual Framework....13

Nature of the Study....15

Definitions....17

Assumptions....18

Scope 20

Delimitation....20

Limitations....20

Significance of the Study....21

Summary....22

Chapter 2: Literature Review....23

Introduction....23

Literature Search Strategy....24
Theoretical Foundation....25
Dual Process Theory....27
Self-Determinant Theory....27
Social Cognitive Theory....28
Conceptual Framework....29
Theorist and Philosophers....30
Literature Review Related to Key Variables and Concepts....32
Physiological Theories....32
Glycogenolysis....33
Gluconeogenesis....33
Pathogenesis of Diabetes Type II....35
Diagnosis of Diabetes Type II....36
Epidemiology....37
Literature Review Related to the Study....38
Methodology Relating to the Research Study....39
Rationale for Selection of the Variables and Concepts....50
Explanation of Controversial Variables....50
Synthesize Studies Related to the Research Question....51
Recommendations for Other Studies....52
Social Impact Relating to Medication Nonadherence....53
Literature Reviewed on Social Change....55

Summary and Conclusions 57
Chapter 3: Research Method 58
Introduction 58
Research Design and Approach 58
Methodology 59
Target Population 59
Selection of Participants 60
Sample Size and Power Calculation 60
Characteristics of Selected Data 61
Data Analysis 62
Variables, Descriptions, and Measurements 64
Inferential Statistics 65
Bivariate Analysis 65
Multivariate Analysis 69
Data Analysis Matrix 73
Threats to Validity 74
Ethical Procedures 75
Summary 76
Chapter 4: Results 77
Introduction 77
Data Collection 79
Study Sample 80

Results....804
Research Question 1 84
Research Question 2 88
Summary....90
Chapter 5: Discussion, Conclusion, and Recommendations 91
Interpretation of the Findings....91
Finding 1: Age and Nonadherence 91
Finding 2: Gender and Nonadherence 92
Finding 3: Income and Nonadherence 94
Finding 4: Migrant Worker Status and Nonadherence 95
Finding 5: Family Size and Nonadherence.... 96
Finding 6: Health Education and Nonadherence 96
Finding 7: Age, Gender, and Nonadherence.... 97
Finding 8: Income, Migrant Worker Status, and Nonadherence 98
Finding 9: Age, Health Education, and Nonadherence.... 99
Finding 10: Income, Family Size, and Nonadherence.... 99
Finding 11: Gender, Health Education, and Nonadherence 99
Limitations of the Study....101
Recommendations....101
Implications to Social Change 102
Conclusion 103
Appendix A: Letter of Permission 118

Appendix B: National Institute of Health Certificate of Completion 121

Appendix C: Curriculum Vitae 122

List of Tables

Table 1. Inclusion and Exclusion Criteria for Qualifying Patients From Which Data Were Gathered 64

Table 2. Diabetes Type II Medication Nonadherence Independent Predicted Bivariate Variables Null and Alternative Hypothesis (*N*=200) 68

Table 3. Multivariate Variables (*N*=200) 71

Table 4. Omnibus Test of Model Coefficient Using SPSS 72

Table 5. Model Summary 73

Table 6. Variables in Model 73

Table 7. Analysis Matrix for the Quantitative Retrospective Research Study Between Medications Nonadherences Among Latinos With Diabetes Type II (*N* = 200) 74

Table 8. Frequency and Percent Distribution of Selected Demographic Characteristics of the Study Subjects Using the SPSS (*N* = 200) 82

Table 9. Frequency and Percent Distribution of Medications Nonadherence Study Subjects (*N* = 200) 83

Table 10. Bivariate Omnibus Test Results SPSS (*N*=200) 84

Table 11. Multivariate Omnibus Test Results for all Variables SPSS (*N*=200) 87

Table 12. Multivariate Omnibus Test Results for Combinations of Variables (*N*=200) 88

Chapter 1: Introduction to the Study

According to Fonseca, Kirkman, Darsow, and Ratner (2012), nearly 26 million people in the United States have diabetes Type II. Fonseca et al. found that 25% of the population ages 25 and older have diabetes or are prediabetic. Furthermore, Gerber (2010) found that diabetes Type II medication nonadherence, which is the cause for many diabetes Type II complications, is high among Latinos, including migrant workers. The National Diabetes Education Program (2007) reported that a cardiovascular disease is a problem for persons with diabetes Type II, leading to disability and early death. The National Diabetes Education Program added that 65% of individuals with diabetes Type II die from coronary artery disease and stroke.

Horton (2012) described persons with diabetes Type II as having complications that socially impact society. This impact is multifactorial from diabetes Type II complications, medication nonadherence, depression, no access to health care, increased emergency room visits to hospitalizations from hyperglycemia, and macro vascular atherosclerotic cardio vascular disease. However, the Latino patient who better adheres to diabetes Type II medications may experience fewer complications. A Type II patient's quality of life may improve if he or she complies with medication requirements, decreasing emergency room visits and hospitalizations. Latinos have a higher opportunity for severe complications impacting their daily life, work, home, and social environment. Thus this, study provides information regarding management of diabetes Type II for the migrant worker who moves from one state to another in search of work. Teaching these

patients how to best manage their diabetes Type II with diet, exercise, regular medications, and how to access resources is a predictor that needs to be explored.

Chapter 1 is divided into 11 sections. Each section provides pertinent information regarding the different topics. The introduction and background contains literature related to the impact of diabetes Type II. In the problem statement and purpose of the study, I discuss the problem being addressed and the intent of the study. I explain the research question and hypothesis as well as the null and the alternative hypothesis for each variable and for the research question. The theoretical and conceptual framework for the study provides information regarding the theories, and I explain how the theory relates to the study. The nature of the study provides information regarding the reason for choosing the method and study design. The definition includes the definitions of the independent variables as well as the dependent variables. Assumptions are used to clarify characteristics of the study that are considered part of the Latinos diabetes Type II beliefs but cannot be described in a true statement. A summary and conclusion close the chapter with themes and how the study fills the gap in the literature.

Background

Cusi and Ocampo (2011) reflected on the importance of health care providers being aware of the need for individualized intervention plans for the Latino patient. Awareness of patients' needs, cultural beliefs, and socioeconomic and socioenvironmental barriers is important in order to plan interventions appropriate for the patient. According to Cusi and Ocampo, a gap exists between ethnic/minorities in the United States, with obesity and being overweight affecting more Latinos than Whites.

Latinos with diabetes Type II poorly manage their disease and have a higher incidence of hyperglycemia, high blood pressure, and elevated hyperlipidemia (Cusi & Ocampo, 2011). Latinos are also at a disadvantage as compared to Whites with more cardiovascular disease and socioeconomic barriers, such as language, cost, and access to resources, including health care (Cusi & Ocampo, 2011). In 2009, Latinos had a higher prevalence of diabetes Type II as opposed to White patients; the prevalence of diabetes Type II for Latinos was 11.8% as opposed to 7.1% for Whites (Cusi & Ocampo, 2011). The predictors of this study were used to determine if there was an association among Latinos with diabetes Type II nonadherence and adherence to medications. Cusi and Ocampo recommended further studies relating to barriers that impact the Latino community with diabetes Type II to improve the social impact, cost, disability, and even death from complications. Hence, improving positive outcomes ought to be the goal for clinicians and physicians. Adherence to medication, diet, and exercise are the triad for better diabetes Type II outcomes.

Chan (2010) stated that medication nonadherence to medication regimens is a health problem impacting the individual, family, community, and resources. Chan estimated that nonadherence is responsible for approximately $100 billion a year in health care costs. Therefore, health education is important not only by the health educators but by the health care providers as well to improve diabetes Type II adherences to medications (Chan, 2010).

The Centers for Disease Control and Prevention (CDC, 2011) noted that, in the United States, the direct expense for diabetes Type II in 2007 was $116 billion for

medical expenses and $58 billion for disability, work loss, and premature death. The CDC reported on complications such as heart disease as the cause of death in 68% of diabetes-related deaths. Stroke was noted to be 16% of diabetes-related deaths. Other complications self-reported by patients with diabetes Type II included 67% with hypertension and diabetes. Moreover, blindness and eye problems were seen in individuals between 20 and 74 years. The CDC reported that between 2005 and 2008, 4.2 million patients had some type of eye problem when they were examined and found that 655,000 diabetes Type II patients age 40 and older had a serious type of diabetic retinopathy. The CDC reported that in 2008, there were 202,290 diabetics with end-stage kidney disease living with regular dialysis or kidney transplant. Additionally, nervous system diseases were found among 60% to 70% of patients with Type II diabetes, including carpal tunnel syndrome, impaired sensation of lower extremities, and erectile dysfunction.

Wroth and Pathman (2006) noted that, regardless of the number of studies done, Latinos' nonadherence to diabetes Type II medications continues to be a problem, and little is known about why patients failed to follow clinicians' recommendations. Smith (2009) pointed out that Afro-Caribbean and Latino descent patients are at a higher risk of diabetes Type II, and a gap still exists in relation to sociodemographics and diabetes Type II affecting Latinos. In their database research relating to diabetes Type II and racial ethnic minorities, Peek, Cargill, and Huang (2007) found that two-thirds of the studies were controlled trials or randomized controlled trials. Therefore, Peek et al. proposed that more studies are needed relating to patients with diabetes Type II of racial, ethnic

minority groups. The specific characteristics ought to relate to the patient's sociodemographics, education, and other variables that relate to the patient's socioenvironment.

Thus, this study was needed to understand Latinos with diabetes Type II nonadherences to medications, taking into consideration age, income, health education, migrant worker status, family size, and gender. Understanding the predictors of nonadherence affecting the Latino community is important to provide primary prevention services to prevent new cases of diabetes Type II (Issel, 2009). Secondary prevention includes providing screening to detect early cases of prediabetes or diabetes Type II and teaching individuals to live with diabetes Type II without increasing morbidity and mortality (Issel, 2009). Tertiary prevention decreases further complication of diabetes Type II through early intervention of cardiac care and skin care, such as heart disease and amputations (Issel, 2009). Knowledge of diabetes Type II obtained through scientific research including health education for clinicians and communities can help improve health outcomes.

Problem Statement

Diabetes Type II is a chronic disease that is prevalent in every community worldwide. According to Fonseca et al. (2012), nearly 26 million people in the United States have diabetes Type II. It was found that 25% of the population ages 25 and older have diabetes or are prediabetic (Fonseca et al., 2012). In the United States, 7.9 million people have prediabetes Type II, as opposed to 1 million people with diabetes Type I (Fonseca et al., 2012). Dall et al. (2010) found that the national cost for health care in

2007 was $218 billion. Furthermore, according to He, Black, Lopez-Payan, Omark, and Schillinger (2009), it cost California $24.5 billion to treat diabetics with Type II complications. According to Gerber et al. (2010), a lack of adherence to diabetes Type II medications is high among Latino patients. There are many barriers that contribute to poor adherence not only to medications but to diet and exercise as well. These barriers relate to patients' values and beliefs, socioeconomic status, a lack of support systems, a lack of knowledge of diabetes Type II, and transportation (Jin, Sklar, Oh, & Chuen, 2008).

Fortmann, Gallo, and Philis-Tsimikas (2011) conducted a multimediator cross-sectional design model to show the importance of social support and community support resources. Fortmann et al. found that social support and community support resources had an effect on medication adherence among ethnic minority groups, including Latinos with diabetes Type II. The participants were mainly females with low socioeconomic status, below the federal poverty line, and low acculturation. Fortmann et al. asserted that the problems with Latinos adhering to medications diet and exercise still existed.

Peek et al. (2007) concluded that ethnic groups, including Latinos with diabetes Type II, were at a higher risk of having complications related to chronic diseases. Ethnic minority groups have higher disparities in relation to diabetes Type II management outcomes and quality of life (CDC, 2011). Therefore, Healthy People 2020 encourage working at improving the quality of care and decreasing health care disparities among minority groups.

This study was needed to understand Latinos with diabetes Type II nonadherences to medications and their barriers relating to age, income, health education, migrant worker status, family size, and gender in order to improve their quality of life and prevent diabetes Type II complications. The World Health Organization (WHO, 2003) encouraged open communication between patients and providers to prevent misconceptions. Poor communication is one factor in increasing medication nonadherence. The health care team and health care system are related factors that are important when providing care to patients of other ethnicities such as African Americans, Asians, American Indians, and Latinos. Misconceptions are responsible for a lack of motivation from both the patient and provider.

Purpose of the Study

I used a retrospective quantitative method research design to develop an understanding of sociodemographic independent variables that may predict an association to medications adherence among Latinos with diabetes Type II. The independent variables included age, gender, income, migrant status, family size, and health education. The dependent variable was adherence to diabetes Type II medications. A logistic regression method was identified as the appropriate analysis criteria variable with two possible outcomes. The methodology involved a retrospective logistic regression, five independent variables, and one dependent variable.

Research Question and Hypotheses

The primary research question has six independent variables and one dependent variable. This leads to six null and alternative hypotheses for testing.

RQ1**:** Are there predictors (age, gender, income, migrant worker status, and family size or health education) of nonadherence to medications among Latinos with diabetes Type II?

$H_0 1$: There is not an association between age and nonadherence to medications among Latinos with diabetes Type II.

$H_a 1$: There is an association between age and nonadherence to medications among Latinos with diabetes Type II.

$H_0 2$: There is not an association between gender and nonadherence to medications among Latinos with diabetes Type II.

$H_a 2$: There is an association between gender and nonadherence to medications among Latinos with diabetes Type II.

$H_0 3$: There is not an association between income and nonadherence to medications among Latinos with diabetes Type II.

$H_a 3$: There is an association between income and nonadherence to medications among Latinos with diabetes Type II.

$H_0 4$: There is not an association between migrant workers and nonadherence to medications among Latinos with diabetes Type II.

$H_a 4$: There is an association between migrant workers and nonadherence to medications among Latinos with diabetes Type II.

$H_0 5$: There is not an association between family size and nonadherence to medications among Latinos with diabetes Type II.

H_a5: There is an association between family size and nonadherence to medications among Latinos with diabetes Type II.

H_06: There is not an association between health education and nonadherence to medications among Latinos with diabetes Type II.

H_a6: There is an association between health education nonadherence to medications among Latinos with diabetes Type II.

Multivariate Analysis

A multivariate analysis method was used to test the association between medication nonadherence and adherence to determine if there were strong predictor values of any combination of two variables to diabetes Type II among Latinos. The independent variables were age, gender, income, health education, family size, and migrant worker status as predicators to medication nonadherence to determine an association among Latinos with diabetes Type II medication adherence.

RQ2**:** Is there a combination of predictors to nonadherence to medications among Latinos with diabetes Type II?

H_07: The combination of age and gender is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a7: The combination of age and gender is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_08: The combination of migrant workers and income is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a8: The combination of migrant workers and income is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$9: The combination of age and health education is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a9: The combination of age and health education is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$10: The combination of income and family size is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a10: The combination of income and family size is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$11: The combination of gender and health education is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a11: The combination of gender and health education is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

Theoretical Framework

Two theories were used as the theoretical framework for the research study. The first was the social cognitive theory developed by Bandura (1998). The second theory of interest was the self-determinant theory (SDT; Skinner et al., 2003). Together these theories focus on the responsibility of care for oneself as it relates to diabetes.

The Social Cognitive Theory

The theoretical framework for the study was the social cognitive theory that includes the SDT (Bandura, 1998; Glanz, Rimer, & Lewis, 2002). Bandura (1998)

described the social cognitive theory as a multifactorial structure that operates in conjunction with goals, outcome opportunities, and assumed environmental social behavior. The theory facilitates actions that motivate humans' health opportunities. Proponents of this theory emphasize three factors: environment, people, and how behavior affects a person's actions and habits. Some concepts under the social cognitive theory include knowledge and skill, environmental perception, values placed on beneficial outcomes, the importance of self-monitoring, goal setting, and self-reward.

This theory is a perception of patients' abilities to enact behaviors, make lifestyle changes, and follow through on action plans. Self-efficacy is related to the cognitive social theory. This theory shifts the responsibility for care to the patient (Skinner, Cradock, Arundel, & Graham, 2003). The theory provides a framework for accepting and determining an association between the environment, social factors, and behavior. Understanding these behaviors and the personal social factors influencing these behaviors, whether environmental or culturally, can help in identifying social or environmental interventions influencing health outcomes (Bandura, 1998; Glanz et al., 2002).

Self-Determinant Theory

The focus of the SDT is on control and motivation. This theory is similar to the social learning cognitive theory. However, the SDT requires more extrinsic actions by the individual. The SDT was part of the workshops used in the health district of Portsmouth, United Kingdom to assist individuals in understanding the Type II diabetes disease processes. Motivation is a highly known precursor for controlling diabetes Type II and

self-management (Skinner et al., 2003). In a study of 2,973 participants getting care from clinics using the integrated model from 2003 to 2004, Williams et al. (2009) used SDT as a way of orienting their participants to a better physical and psychological health. Developing a program that includes the SDT will allow the participants to be self-efficient and self-motivated about adhering to the recommendation from their physician and other clinicians. SDT provides tools that assist patients in changing negative behaviors for positive lifestyle changes (Williams et al., 2009).

Foundation for the Study

Bandura (1998) theorized that lifestyle and behavioral changes by patients are not made at the spur of the moment, but by consciously developing methods of improving how they are going to behave and respond to the social environment. These methods are psychologically interpreted and self-directed and cause behavioral and lifestyle changes. The foundation for the theoretical framework used to guide the research was based on the concept that people cannot motivate themselves when attempting to change developed habits from a young age. Individuals with diabetes Type II can use the SDT (Skinner et al., 2003) and the social cognitive theory (Bandura, 1998) to self- monitor and self-regulate their actions by learning the physical outcomes that motivate behavior. These include sensory experiences and physical social behaviors. In meta-analyses, researchers have verified the function of the SDT values, regardless of how diverse an individual might be in relation to health. Teaching the SDT and the social cognitive theory prepares the person to predict these base functions, including sociodemographics characteristics

and social factors relevant to chronic disease (Holden, Moncher, Schinke, & Barker, 1990; Stajkovic & Luthans, 1998).

Conceptual Framework

Concepts in relation to diabetes Type II nonadherent behaviors and lifestyle changes are provided frequently in health care outpatient clinics, hospitals, and emergency rooms. There are many reasons for nonadherence and, even though education on nonadherance has been given for decades, the problem has not been resolved. Martin, Williams, Haskard, and DiMatteo (2005) discussed increased morbidity and mortality with nonadherence to medications affecting the patient's well-being and increasing the health care economic burden relating to diabetes Type II complications. The concept of adherence management for Latino patients ought to be simple by eliminating complex recommendations, encouraging daily medication use, and incorporating lifestyle changes to diet and other behaviors. Martin et al. agreed that at least 40% of patients misunderstand instructions given for prescribed medication and forget or even disregard advice given by their physician or health educators. Twelve percent of people in the United States with diabetes Type II do not fill their prescription, 12% do not take their medication, 29% stop taking their medication before they run out, and 22% miss dosages in order to have their medication for a longer period of time (American Heart Association, 2009; Martin et al., 2005). Schectman, Nadkarni, and Voss (2002) noted that sociodemographics and low socioeconomic status also yielded poor diabetes Type II nonadherence, including negative health outcomes.

Peek et al. (2007) described diabetes Type II management classified by the target population, clinicians, and health care systems, concluding that patients have the ability to self-manage if properly educated, thereby improving their self-outcome. The limited number of epidemiological interventions that have been properly analyzed has contributed to the poor adherence among racial ethnic groups including Latinos (Elliot, Shinogle, Pelle, Bhosle, & Hughes, 2008). The models that have been tested had no target population or specific need in the health care system (Noble, Mathur, Dent, Meads, & Greenhalgh, 2011). The epidemiological prevalence of diabetes Type II is one in 10 U.S. adults as reported in 2007 (Noble et al., 2011). The increase of diabetes Type II has affected individuals with limited resources, finances, education, and sociodemographic instability, adding to diabetes Type II complications, depression, and poor adherence to medications.

The problems with medication nonadherence exist among several ethnic groups in the United States. However, nonadherence is more evident among people of limited resources, including Latinos. The conceptual framework was used to improve health care outcomes, prevent complications, and relate to the awareness of individuals' necessities. These necessities include knowledge of the disease, sociodemographic surroundings, and motivation to self-manage the disease. The WHO (2003) noted that health education is not only for patients but clinicians as well to be able to deliver similar protocols where both the clinician and the patient are ready for adherence supported by a health delivery system.

Nature of the Study

The intent of the study was to determine if there were predictors of nonadherence to diabetes Type II medications using a quantitative retrospective method design. The objective of this retrospective quantitative research study was to understand the association between the independent variables age, gender, income, migrant status, family size, and health education among Latinos with diabetes Type II.

The logistic regression analysis was used to predict continuous variables, discrete, or a combination of continuous and discrete. Age was treated as a continuous variable, divided into age groups: 18 to 30 years of age, 31 to 45 years of age, 46 to 60 years of age, and 60 and over. Sex was classified as males versus females, health education as yes versus no, and migrant worker status as yes versus no. These were treated as dichotomous variables. Health education was determined by diabetes Type II health education classes the participant attended. Income was categorical dummy coded by the following classification 0= *none*, 1=$*1 to $10, 000 per year*, 2=$*10,001 to $15,000 per year*, 3=*$15,001 to 20,000 per year*, and 4=*$20,001 or more*. The dependent variable in this analysis was adherence to medications; the two levels of variables were adherence versus nonadherence. A 95% confidence interval was used to represent the correlation between the independent variables and the dependent variable with a *p* value of less than 0.01, calculated by applying the Bonferroni correct. Overall model significance or the Omnibus test of model coefficients for the logistic regression was examined by the effect of the predictor variables on adherence to medication, presented with an X^2 coefficient. The Cox and Snell R^2 and Nagelkerke R^2 were used to examine the percentage of variance

accounted for the predicted variables. Predicted probabilities of an event occurring was determined by the expected (β; Tabachnick & Fidell, 2012).

Logistic regressions overcome many of the restrictive assumptions of linear regressions. Linearity, normality, and equality of variance are not assumed, nor is a normally distributed error term variance assumed. The major assumption of the logistic regression is that the outcome variable must be discrete. The data should not contain outliers, and there should be a linear relationship between the odds ratio and the predictor variables (Tabachnick & Fidell, 2012). Linearity with an ordinal or interval predictor variable and the odds ratio can be checked by creating a new variable that divides the existing predictor variable into categories of equal intervals and running the same regression on these newly categorized versions as categorical variables. Linearity is demonstrated if the B coefficient increases or decreases the linear steps (Garson, 2009). Finally, a large sample is recommended, fitting with the maximum likelihood method. Using discrete variables requires that there are enough responses in each category.

The data were collected using secondary, archived electronic medical records from a database at Clinica Sierra Vista in Fresno, California, a nonprofit primary care community clinic. This retrospective study covered the period from 2010 to 2014. The database at Clinica Sierra Vista was linked to i2i Media Tracks that serviced eight clinics from rural, suburban, and urban impoverished areas of Fresno, California. The data were entered into IBM SPSS Statistics Software (Version 21). Frequencies, mean, and standard deviations were calculated for age, gender, income, health education, family size, and migrant worker status by adherence or nonadherence to diabetes Type II

medications. Depending on the predictors, an outcome action plan with recommendations to patient management and adherence to diabetes Type II medications was prepared. The results of the data were presented to both clinicians and staff for them to encourage patients to enter medication assistant programs, health system resources, and free medication pharmaceutical programs available to patients with limited income.

Definitions

Adherence: The extent that patients take their medications, exercise and follow a strict diet as directed by a clinician or medical physician (Skinner et al., 2003). Diabetes Type II medication nonadherence is related to age and gender. Fischer et al. (2010) described age and gender as possible predictors. However, the literature was limited in the number of patients who fail to fill their prescriptions as recommended by their physician and recommendations to exercise and diet. Fischer et al. described males and younger adults as having better adherence to medications as prescribed by physicians. Latinos, both males and females, have a higher rate of nonadherence to medications with a higher number of complications (Peek et al., 2007).

Diabetes Type II: An illness that interrupts the body glucose pathway. Every cell in the body needs glucose in order to function to its optimal potential. The glucose gets into the cell with the help of an insulin hormone. When insulin is depleted, or the body stops releasing insulin, glucose increases in the blood stream (McCulloch, Nathan, & Mulder, 2012).

Nonadherence: This term relates to a prescription or recommendation from a clinician not followed by a patient. Nonadherence to medication is multifactorial and changes with each situation and patient (White, 2011).

Primary prevention: Actions, activities, or interventions done to prevent disease or illness. An example is daily exercise, a diet lower in cholesterol, salt, and fat, and maintaining appropriate calories as recommended by the CDC, health educator, nutritionist, or physician (Issel, 2009).

Secondary prevention: Providing screening tools for prediabetes or for diabetes type II to start early intervention (Issel, 2009).

Tertiary prevention: Interventions or actions to prevent further complication of diabetes Type II. Tertiary prevention assists in preventing diabetes Type II complications such as amputations or renal disease (Issel, 2009).

Assumptions

Perez-Escamilla, Garcia, and Song (2010) described acculturation as playing a role in migrant workers' abilities to access health care. Increased risk behaviors such as drug abuse, unsafe sex practices, chronic as well as infectious diseases, and nonadherence to medications are behaviors affecting the Latino migrant workers. Perez-Escamilla et al. noted that migrant workers and Latinos born in the United States with family ties in Mexico often received health care from Mexico, including purchasing medications from Mexico through a relative or friend. The migrant worker population is usually not well documented, and specifics of the numbers are difficult to assume. Moreover, the migrant

worker population is unknown, moving from one state to another with their families, looking for agricultural work.

There are many cultural beliefs within the Latino population that determines the outcome of diabetes Type II, such as El Susto. El Susto is a form of fear caused by someone or something in the environment precipitating the beginning of an illness such as diabetes Type II (Swan, 2010). Fatalismo is another health belief that determines the individual's response to diabetes Type II. Fatalismo means that the person cannot change the direction of the disease (Campos, 2007). Familismo is an important aspect of the family. The need of the family and other families come first, similar to the compadre belief. Rios (1998) described Espiritismo as the belief system made of both good and evil spirits that can affect a human's health and quality of life.

Many Latinos depend on curanderos, a folk healer who uses home remedies and herbs. The Latino population believes that curanderos have mental powers and abilities to cleanse the body from evil spirits, including skills to manage many acute diseases as well as chronic illnesses. Patients keep this information to themselves in fear of being judged by Western medicine clinicians. Sociodemographics are variables that determine the course, interest, and self- management of diabetes Type II by patients. The beliefs above increase the assumption that the health history is not always accurately reported or completed.

The study depended on the assumption that the archive electronic medical records in the database were accurate and entered using precise data information by the

originators of the data. It was assumed that the information provided by the patients was accurate, including risk factors to diabetes Type II.

Scope

The retrospective quantitative research method design was done using a secondary archived medical record review. This quantitative retrospective research study covered the period from 2010 to 2014. The target population was Latinos from Fresno, California age 18 and over with diabetes Type II.

Delimitation

The data were collected using secondary electronic archived medical record reviews. The participants were mainly Latinos with diabetes Type II, males and females, age 18 and over. Clinica Sierra Vista serviced eight clinics from rural, suburban, and urban impoverished areas of Fresno. Nonadherence to diabetes Type II medications among Latinos is a problem, increasing the complication rate and cost to the nation. The study was limited to the sociodemographic variables of age, gender, income, migrant worker status, family size, and health education. However, there are many variables related to diet, physical activity, depression, folk remedies, and acculturation that required further studies addressing the needs of Latinos with diabetes Type II.

Limitations

A disadvantage of a retrospective cohort study relates to the limited information with no avenue for follow-up, providing only prior outcomes. Another limitation of a retrospective design study is that it cannot identify cause and effect. Retrospective research studies are prone to selection bias, secondary to loss of records. Due to limited

access to data, the target population was limited to Latinos with diabetes Type II located in Fresno, California. Latinos are Mexican Americans, immigrants from Mexico, Central America, South America, and any other Hispanic person including Portuguese. New patients diagnosed with diabetes Type II in 2014 may have limited information on medication nonadherence.

Data were collected up to 5 years back in order to have an increased sample size. The possible responses to the predictors defined were limited for consistency. Hypothesis testing and statistical testing were done to prevent systemic errors.

The data were dependent on patients who had identified themselves as being of Latino race on their data sheets. Some patients, however, might have falsely identified themselves as being Latino, while patients who are Latino might not have identified themselves as being of Latino race.

Significance of the Study

Horton (2012) described diabetes Type II complications as having a high impact on their quality of life. This quality of life is impacted by diabetes Type II complications, medication nonadherence, depression, no access to care, and hospitalizations. Horton recommended understanding patients' characteristics, their view of health care, and their understanding of the disease. The health care provider's approach to patients will determine an effective positive outcome; including the patient's social environment and cultural barriers (Horton, 2012). Nonadherence to medications impacts the patients' well being, including their quality of life. Understanding why Latinos, one of the largest groups in the United States, lack adherence to medications is an important step in

improving health care outcomes for this population. Health care costs will be decreased due to reduced complications, improved quality of life, and reducing morbidity and mortality among Latinos with diabetes Type II.

Summary

Chapter 1 contained an introduction to diabetes Type II medication nonadherence among Latinos in the United States, the implications of diabetes Type II nonadherence to medications, and how it relates to the sociodemographics predictors among Latinos, including migrant workers. In this chapter, I provided information relating to prediabetes and diabetes Type II complications and costs to the state, nation, community, and individuals. Diabetes affects young individuals' health including obesity, hypertension, hyperlipidemia, and depression. I discussed the associations between the variables and the outcome of diabetes Type II. The emphasis was on the Latino community in Fresno, CA. This target population is at a higher risk of developing diabetes Type II at a young age. Chapter 2 is a detailed description of the theoretical framework and literature reviewed. Chapter 3 provides the methodology for the study. In Chapter 4, I present the results of the study. In Chapter 5, I describe recommendations for future study and study implications.

Chapter 2: Literature Review

Introduction

Diabetes Type II is a chronic disease prevalent in every community worldwide. According to Fonseca et al. (2012), nearly 26 million people in the United States have diabetes Type II. Twenty-five percent of the population ages 25 and older have diabetes or are prediabetic (Fonseca et al., 2012). Gerber et al. (2010) found that nonadherence to diabetes Type II medications, which is the cause for many diabetes Type II complications, is high among Latino patients. The National Diabetes Education Program (2007) reported that cardiovascular disease is a problem for persons with diabetes Type II, leading to disability and early death. The National Diabetes Education Program added that 65% of individuals with diabetes Type II die from coronary artery disease and stroke (Fonseca et al., 2012).

There is a 60% nonadherence to medications among Latinos with diabetes Type II (Parada, Horton, Cherrington, Ibarra, & Ayala, 2012). Thus improving adherence to diabetes Type II medications is a goal for every health care provider. However, nonadherence to medications, diet, and exercise is a problem that carries many complications; it affects the individual's self-concept and self-satisfaction (Delamater, 2006; Gerber et al. 2010). Salas, Hughes, Zuluaga, Vardeva, and Lebmeier (2009) argued that nonadherence to medications affects the cost effectiveness of pharmaceuticals, costing the U.S. economy close to $100 billion per year. Lau and Nau (2004) researched oral antihyperglycemic medication nonadherence preceding hospitalization and found that 28.9% of diabetes Type II participants were nonadherent to medications. Researchers

have described the significance of research with strategies to help patients understand the importance of taking their medications.

Chapter 2 is divided into six sections. Each section provides information regarding different topics. These sections are as follows: The introduction contains a brief overview and statistical figures related to other studies; the literature search strategy includes terms and criteria; the theoretical foundation and the conceptual framework include the theories used in different studies; an extensive review of the literature relates key variables and concepts to sociodemographic predictors of medication nonadherence; and the final section includes a summary and conclusion.

Literature Search Strategy

The literature review was conducted using peer-reviewed articles dating from 1992 to 2012 on diabetes Type II medication nonadherence, adherence, and the theoretical framework. The resources used included EMBASE, Cochrane Library, Walden University Library, PubMed, Medline, and the National Library of Medicine. Key terms used included *nonadherence, adherence, compliance, cost, resource utilization*, and *medication expenses*. Other key terms are *diabetes Type II, hyperglycemia, antidiabetic medications, insulin, oral anti diabetic agents,* and *diabetes-related complications*.

Criteria selection for the peer-reviewed studies depended on publication date, giving priority to articles from 2005 to present. Studies that related to glycosylated hemoglobin (hbA1C) as a proxy were used as an alternative to medication adherence. hbA1C is a well-accepted measurement of diabetes Type II hyperglycemic controls.

Studies were excluded if the article provided insufficient data or did not have adherence information.

Nonadherence is defined by different methods. Delamater (2006) defined nonadherence as not following recommendations from physicians, dietitians, or counselors. These recommendations relate to medications, diet, or exercise. Leichter (2005) described nonadherence, as opposed to noncompliance, determining that the two terms are similar. Noncompliance denotes a negative opinion in relation to diabetes, whereas nonadherence implies failure to follow prescriptions given to patients by physicians or counselors without partiality. Parada et al. (2012) studied Spanish-Speaking Mexican-origin adults living along the US-Mexican border and found that 65% were classified as nonadherent to medications and did not follow diabetes Type II recommendations relating to behavior and lifestyle changes.

Theoretical Foundation

The theoretical foundation includes the theories used in different studies and the relation to the theoretical framework. There have been different theories applied in past research studies regarding nonadherence as opposed to adherence to medications, diet, and exercise. White (2010) compared two groups of patients in Denmark. One group was continually evaluated by their physicians using diabetes Type II specific-goals, information, patient education, patient feedback about the management of diabetes Type II, and an assessment of the outcomes. The second group was set up using a conventional approach with nonintervention physicians. The group with goal settings responded with positive outcomes, decreased hbA1C, decreased blood glucose, lower blood pressure, and

decreased cholesterol levels at the end of 6 years. The conventional therapy group of diabetes Type II participants had negative outcomes with no changes in their lifestyle behaviors (White, 2010). Another method of changing lifestyle behaviors in patients with diabetes Type II was the use of systems interventions. This type of intervention attempts to improve environmental factors that guide self-management by intervening with economic determinants. The intervention is done through policies and protocols to provide for test strips, lancets, and glucose meters. Other programs, such as transportation, are also provided to improve the quality of care (White, 2010). In order to improve patient adherence, patients and physicians must take an active role in health education relating to medications, diet, and exercise. Adherence to diabetes Type II medications requires theories and philosophies related to self-management and education of individuals with diabetes Type II. Skinner et al. (2003) described the self-regulation theory that focuses on individuals' behaviors, emotions, and response to the disease. The six core basic elements are

1. Identify signs and symptoms of the disease.
2. Describe the risk factors relating to diabetes Type II.
3. Be aware of how long a person has diabetes Type II.
4. Understand the consequences of diabetes Type II in the present and in the future.
5. Explain how to maintain diabetes Type II daily controlled.
6. Know the complications of not treating diabetes Type II.

Dual Process Theory

The dual process theory has been used in the education of diabetes Type II disease processes. The health district of Portsmouth, United Kingdom conducted a series of self-management workshops for patients newly diagnosed with diabetes Type II to improve adherence to medications, diet, and exercise. The individuals were asked about their understanding of diabetes Type II as well as the signs and symptoms. These individuals were provided with information regarding diabetes Type II (Skinner et al., 2003). Skinner et al. (2003) used the theory to improve diabetic education in assisting individuals with diabetes Type II to follow medication, diet, and exercise recommendations. Through active participation, the individuals with diabetes Type II were able to understand the meaning of diabetes, the management of the disease, and the prevention of complications. The individual was responsible for active participation in their lifestyle behavioral changes and self-management. This included improving adherence to medication, diet, and exercise (Skinner et al., 2003).

Self-Determinant Theory

The focus of the SDT is on control and motivation. This theory is similar to the social learning cognitive theory. The exception is that it requires extrinsic actions by the individual. SDT was part of the workshops used in the health district of Portsmouth, United Kingdom to assist individuals in understanding the diabetes Type II disease processes. Motivation is a precursor for controlling diabetes Type II and self-management (Skinner et al., 2003). In a study of 2,973 participants getting care from clinics using the integrated model from 2003 to 2004, Williams et al. (2009) used SDT as

a way of orienting their participants to better their physical and psychological health. Williams et al. concluded that developing a program that included the self-determinant theory will allow the participants to be self-efficient and self-motivated about adhering to the recommendation from their physician and other clinicians. The SDT provides tools that assist patients in changing negative behaviors for positive lifestyle changes (Williams et al., 2009).

Social Cognitive Theory

The social cognitive theory is the perception of patients' ability to enact behaviors, make life style changes, and follow through on action plans. SDT is related to the cognitive social therapy. This theory shifts the responsibility for care to the patient (Skinner et al., 2003) and was used as the theoretical framework of the research study; it includes the self-efficacy learning theory (Bandura, 1998; Glanz et al., 2002). Bandura (1998) described the theory as a perceived multifactorial structure that operates in conjunction with goals, outcome opportunities, and assumed environmental social behavior; facilitating actions that motivate humans in health opportunities. This theory includes three factors: environmental, people, and how behavior affects a person's actions and habits. Some concepts under the social cognitive theory include knowledge and skill, environmental perception, values on beneficial outcomes, the importance of self-monitoring, goal setting, and self-reward. The social cognitive theory provides a framework for accepting and determining an association between the environment, social factors, and behavior. Understanding these behaviors and the personal social factors

influencing these behaviors can help in identifying social or environmental interventions influencing the outcome (Bandura, 1998; Glanz et al., 2002).

Bandura (1998) theorized that that lifestyle and behavioral changes are consciously developed methods of improving how patients are going to behave and respond to the social environment. These functions are psychologically interpreted and self-directed to be able to cause behavioral and lifestyle changes. The foundation for the theoretical framework that was used to guide the research was based on the concept that people cannot motivate themselves when attempting to change learned habits from a young age. Therefore, the SDT and social cognitive theory empower individuals with diabetes Type II to self-monitor and self-regulate their actions by learning the physical outcomes that motivated behavior. These physical behaviors include sensory experiences and physical social pleasures. The risk factors that influence diabetes Type II are a part of the cycle. In meta-analysis studies, researchers have verified the function of self-efficacy values, regardless of how diverse an individual might be in relation to health. The SDT and social cognitive theory prepare the person to predict these base functions including sociodemographics characteristics and social factors relevant to chronic disease (Holden et al.,1990; Stajkovic & Luthans, 1998).

Conceptual Framework

Concepts in relation to diabetes Type II nonadherent behaviors and lifestyle changes are heard frequently in health care outpatient clinics, hospitals, and emergency rooms. There are many reasons for nonadherence, and even though education programs have been given for decades, the problem has not been resolved. Martin et al. (2005)

discussed increased morbidity and mortality with nonadherence to medications affecting the patient's wellbeing and increasing the health care economic burden relating to diabetes Type II complications. The concept of adherence management for Latino patients ought to be simple, eliminating complex recommendations, encouraging daily medication use, lifestyle changes to diet, and other behaviors such as exercise. Martin et al. agreed that at least 40% of patients misunderstand instructions given for prescribed medication and forget or disregard advice given by their physician or health educators. Twelve percent of Americans with diabetes Type II do not fill their prescription, 12% do not take their medication, and 29% stop taking their medication before they run out, and 22% take their medication to have medication for a longer period of time (American Heart Association, 2009; Martin et al., 2005). Schectman et al. (2002) noted that sociodemographics and low socioeconomic status also yielded poor diabetes Type II nonadherence, including negative health outcome.

Theorist and Philosophers

Gorge (1994) stated that a vegan diet should not be promoted as a way of life because the financial limits of such a diet make it possible only for those with financial means; others could not consume it safely. However, Tonstad, Butler, Yan, and Fraser (2009) found in a study of 22,434 men and 38,469 women that vegetarianism potentially protects against obesity and diabetes Type II. Many vegan individuals see this diet as a phenomenon that helps decrease not only obesity but elevated lipids as well decreasing cardiac events, which prevents early onset of diabetes Type II (Tonstad et al., 2009).

The philosophy of Kaira et al. (2010) was based on patient advocacy and placing the individual at the center rather than diabetes Type II. The goal of Kaira et al. was to educate and empower individuals with diabetes Type II to adhere to diet, medications, physical activities, and other recommendations to better the quality of life and outcome. Snyder (2012) claimed that diet and exercise are first and medications second. This philosophy's concept is on diet control and weight loss. Snyder determined that if an individual with diabetes loses at least 7% of weight, this individual has a better chance of controlled diabetes Type II. Skinner et al. (2003) also placed the responsibility on the patient. The patient is responsible for making decisions that will assist in being in control of his or her diabetes Type II physical and emotional health outcomes. Snyder's recommendations were not only for the patient but for the health care provider as well to treat the patient with respect, empathy, and warmth and to make the educational experience a success. The philosophy of treating others with respect is valuable, especially when working with people from different educational, cultural, and ethnic backgrounds.

Stajkovic and Luthans (1998) examined self-efficacy, work-related performance, and a correlation between self-efficacy and performance. Stajkovic and Luthans, used the social cognitive theory, both self-reactive and contextual characteristics that influence how the person views or perceives behavior. They also examined the association between individuals and the overall basis for their behaviors, determining that there is a correlation between self-efficacy and work-related behaviors. These work-related behaviors include social behaviors as well as work-related health determinants such as

depression, anxiety, and a lack of motivation. The social behaviors are related to overeating, substance abuse, and smoking.

Literature Review Related to Key Variables and Concepts

Physiological Theories

The endocrine cells of the pancreas are located in the islets of Langerhans, made up of two types of cells, Alpha-cells and Beta-cells. These cells are found scattered all around the islet of Langerhans. The Beta cells make up 60% of the endocrine body of the pancreas, responsible for insulin and myelin. Insulin is released in response to glucose levels (Spellman, 2010).

DeFronzo and Tripathy (2009) concluded that skeletal muscle is the major site of glucose uptake in humans in the postprandial state. DeFronzo and Tripathy noted the changes in leg muscle through the precise estimate of leg muscle glucose uptake with positron emission tomography, a tool proven effective in providing new information about reduced muscle insulin tissue resistance in diabetes Type II. Glucose is not used by the muscle cells with diabetes Type II. However, glucose is released into the blood stream causing a hyperglycemic state. This change in insulin resistance increases metabolic abnormalities, (DeFromzo & Tripathy, 2009; Spellman, 2010).

In a person with diabetes Type II, it is important to understand the action of carbohydrates and insulin. After eating a meal, carbohydrates are broken down into small glucose molecules in the gut. These glucose molecules are absorbed into the blood stream elevating the glucose levels. The elevated glucose stimulates release of insulin from the beta cells in the pancreas. Insulin allows the entrance of glucose into most of the cells to

be used as energy by binding to certain cellular receptors (Leahy & Pratley, 2011). When glucose levels exceed the cell needs, the extra glucose is stored in the liver as glycogen. The liver acts as a reservoir until glucose is needed by the cells. The liver produces glucose from fatty acids and from proteins or amino acids through a process of gluconeogenesis. Glycogenolysis and gluconeogenesis together help in increasing blood glucose levels. Glycemia is controlled by a complex relation between the stomach, pancreas, and the liver (Mealey, 2005).

Glycogenolysis

Glycogenolysis is how the body breaks down glycologen into glucose from the liver and muscle tissue before it is used by the body. The breakdown can be of muscle tissue called glucose 6-phosphate. The breakdown occurs in the cytoplasm of cells; glycogen is the main product from carbohydrates. Glycogenolysis occurs during periods of fasting or during exercise to provide 6-phosphatate for glycolysis as needed for Adenosine Triphosphate (ATP) (Cellular Respiration, 2012).

Gluconeogenesis

Gluconeogenesis is the process of glucose from noncarbohydrate foods. The major originators are pyruvate, lactate, glycerol, and glucogenic amino acids. A few main organs require a constant supply of glucose to be used as energy. These organs are the brain, renal medulla, erythrocytes, lens and cornea of the eye, exercising muscles, and testes. About 90% of gluconeogenesis occurs on the liver and about 10% of gluconeogenesis occurs in the kidney (Cellular Respiration, 2012)

There are many other theories relating to diabetes Type II function and dysfunction, as well as theories on how to approach this chronic disease. Leahy and Pratley (2011) theorized that adipose tissue leads to insulin resistance and diabetes Type II. This theory is known as the lipotoxocity ectopic theory. The lipotoxocity ectopic theory alters the redistribution of fat in the skeletal muscle, liver, and beta cells by sending messages to adipose tissue molecules increasing an adipose tissue inflammatory response. This inflammatory response is known as the secreted factor theory that causes a low grade pro-inflammatory response affecting the insulin production and beta cells function leading to diabetes Type II (Leahy & Pratley, 2011). Leahy and Pratley pointed to central obesity or the fat found around the waist. This fat is not considered to be subcutaneous fat predisposing people to insulin resistance and diabetes Type II.

Lebovitz ‘s (1999) theory was that diabetes Type II depended on genetic, as well as environmental factors, and that it resulted from evolution of a thrifty genotype that had survived in the past but has grown in the present time. Lebovitz compared the theory and determined that it represents an adult metabolic response to fetal malnutrition. Lebovitz’s philosophy was that diabetes Type II is attributed to insulin deficiency. Lebovitz’s theory has been controversial. However, Khoury, Bedrosian, Gwinn, Ioannidis, and Little (2010) identified phenotype similarities among families with diabetes Type II.

Remington, Brownson, and Wegner (2010) noted that there are many factors that contribute to diabetes Type II such as smoking, obesity, hypertension, and elevated lipids. Other contributing factors consist of physical inactivity, poor diet, smoking, and alcohol

consumption. Obesity increases the risk of insulin resistance, increasing a chance for diabetes Type II (Remington et al. 2010).

Rubino's (2008) theory is that the problem with diabetes relates to the duodenum or the small bowel in the pathophysiology of the disease. Rubino discussed the rearrangement of the gastrointestinal anatomy as a primary means of preventing or stopping diabetes Type II in morbid obese individuals. Rubino theorized that diabetes Type II is an intestinal disease, proposing Roux-en-y gastric bypass surgery, in combination with bilious-pancreatic diversion (BPD).

Pathogenesis of Diabetes Type II

Diabetes Type II is not clearly understood. It is believed to be linked to obesity and genetic predisposition to certain families within the same culture. Diabetes Type II is also recognized in groups with low socioeconomic position (Ramlo-Halsted & Edelman, 2000). Diabetes Type II is higher in Latinos, African Americans, Pacific Islanders, and American Indians. Ramlo-Halsted & Edelman determined that many risk factors contribute to diabetes Type II insulin resistances such as obesity, aging, and a lack of exercise. They also concluded that a lack of self- management comprehension and decreased cognitive abilities contribute to risk factors that increase the complications of diabetes Type II, including elevated glucose and free levels of fatty acids.

Diabetes Type II is considered to be a metabolic triad defect affected by insulin resistance, B-cell dysfunction, and hepatic glucose dysfunction (Ramlo-Halsted & Edelman, 2000). Insulin resistance is recognized by high levels of glucose in the blood stream. Pancreatic B-cell dysfunction is caused by the release of increased levels of

glucose stimulating insulin. Impaired hepatic dysfunction is caused by increased glucose production. After eating, persons with diabetes Type II have a combination of increased glucose postprandial, ineffective release of insulin, and suppression of glucose output needed by target tissue cells, such as skeletal muscles (Ramlo-Halsted & Edelman, 2000).

Obesity, a lack of exercise, and risky behaviors such as smoking and alcohol consumption contribute to increased glucose and decreased insulin from the pancreas B-cells. In time, insulin resistance becomes chronic where no insulin is released and exogenous insulin is required (Ramlo-Halsted & Edelman, 2000). Many patients have no concept of why they have diabetes Type II. Latinos believe that it is part of el susto, a frightening experience that causes an acute stress situation affecting the body physically and mentally.

Diagnosis of Diabetes Type II

The American Diabetes Association's (2012) new recommendations differ from the old recommendations. The old recommendations for diabetes Type II were based on fasting plasma glucose (FPG) or a two hour value after taking 75 gram of oral glucose tolerance test (OGTT). The new recommendations were standardized by the American Diabetes Association, the International Diabetes Foundation (IDF), and the European Association for the Study of Diabetes (EASA). The EASA made recommendations to use the hbA1C test as a mean of diagnosing diabetes Type II, with a threshold of >6.5%. Their recommendations were accepted by the American Diabetes Association in 2010 (American Diabetes Association, 2012).

Epidemiology

Inzucchi et al. (2012) noted that diabetes Type II prevalence is increasing worldwide, but at a higher number in underdeveloped countries and higher among individuals with obesity, elevated hyperlipidemia, and hypertension. The trend is thought to be related to lifestyle behaviors that are associated with the Western world, in particular, diet and exercise. The economic burden is high and continues to climb (Inzucchi, 2012). Chan (2010) reported that 10% of hospitalizations and 23% of nursing home admissions per year are related to diabetes Type II non adherence, increasing the health care cost to around $100 billion a year. Parada et al. (2012) documented an increase in medication nonadherence of Latinos with diabetes Type II. The study was a randomized controlled trial of 302 patients randomly sampled, and Parada et al. found that 60% of patients were nonadherent to diabetes Type II medications. Latinos are more likely to have a higher rate of nonadherence to diabetes Type II medications (Horton et al., 2012). Nonadherence to medications, diet, and exercise remains the most important reason for cardiovascular disorders, blindness, end-stage renal failure, amputations, and hospitalizations (Martin et al., 2005).

Kockaya and Wertheimer (2011) revealed that diabetes Type II is linked to depression, decreased cognitive abilities, cancer, neuropathies, and other disabling conditions, including death. In a study done between 1998 and 2002, the CDC (2011) found that where Latinos dwell is of importance on how diabetes impacts each person's life due to cultural influence. Wabe, Angamo, and Hussein (2011) indicated that the worldwide adherence rate of diabetes Type II medications was approximately 36% to

93%, depending on the demographics and socioeconomic status of the individuals. Wabe et al. found that prescriptions in Ethiopia were given to 351 patients. Out of the 351 patients, 33 were prescribed insulin and 312 were prescribed oral hypoglycemic medications. Out of the patients receiving oral medications, only 42.8% of patients showed proper glycemic control. The reasons for nonadherence to medications as reported to the investigators were limited finances and the fear of side effects from drugs. A study done in the Netherlands showed that adherence to oral medications was approximately 61% to 85% (Vervloet et al. 2011). In Nigeria, Adejoh (2012) showed that 66% of patients were nonadherent to oral diabetes Type II medications. Chan (2010) found that in the United States, adherence to medications was approximately 36% to 93% depending on demographics and socioeconomic factors. Miccoli, Penno, and Del Prato (2011) found in a retrospective cohort study of 2,741 participants, using the patient's medical and pharmacy claims from a managed care plan in Oregon, that nonadherence to medications was 19% to 35%. In studies done of Latinos and Nigerians compared to the Netherlands and Oregon researchers showed that patients of low socioeconomic factors and demographics had a higher rate of diabetes Type II medication nonadherence.

Literature Review Related to the Study

The intent of the research study was to determine predictors of nonadherence to diabetes Type II medications using a quantitative method design. The objective of this retrospective quantitative research study was to develop an understanding of the sociodemographic independent variables, age, gender, income, migrant worker status, family size, and health education to predict adherence to medications among Latinos with

diabetes Type II. A binary logistic regression with multiple variables was conducted. The dependent variable was adherence to medications. The logistic regression permitted the evaluation of the odds of membership in adherence versus nonadherence, overcoming many of the restrictive assumptions of linear regression.

Methodology Relating to the Research Study

Gerber et al. (2010) discussed a mixed method study of nine patients with a mean age of 58 years who had diabetes for 21 years or more. The clinical staff at the University of Illinois, Chicago Medical Center assisted Latino patients with poorly controlled diabetes Type II, determined by a hbA1C > 8.0%. A team research member assisted the patients by completing their history, medication list, health literacy, medication benefits, depression, social support and access to care, diabetes knowledge, language spoken in the home, and numeracy. The team promoter of health worked with these patients at home, at a clinic, and through telephone calls. Medication management was provided for 6 months. The health promoters worked to maintained open communication between the pharmacist and the patient and in preventive complex patient barriers. The team worked at improving medication adherence and to teach self-care adherence among Latinos with Type II diabetes. The study required many hours of frequent communication with patients, means to address barriers, and telephone call time to discuss any issues with participants**.** The study was based on their hbA1C, health education, knowledge of diabetes, and language spoken in the home. Their sociodemographics were used to aid in improving the blood glucose levels for Latino patients with hbA1C > 8.0% residing in low socioeconomic areas. The study provided information on the importance of

collaboration with other health care providers such as the pharmacists, counselors, health educators, and other members of health care teams.

The WHO (2003), in a review of literature using a cross-sectional design, found that medication adherence is related to socioeconomic status depending on the diabetes medication regimen. Fifty-nine patients, 25 years and older, were followed regarding medication adherence. The WHO found that poor communication between patient and provider increases the rate of nonadherence to medications. Therefore, health care teams and health systems are important when providing care to patients of other ethnicities such as African Americans, Asians, American Indian, and Latinos. Strategies and goals ought to be set up first by the health care teams in order to improve communication to prevent misconceptions (WHO, 2003). These misconceptions are responsible for a lack of motivation from both the patient and the provider.

Studies have lacked adherence standards as part of the intervention or motivation process. Miscommunication between the patient and provider created a deficit in the patient's health education with no intervention on how to reach the patient. The WHO (2003) reviewed literature published from 1980-2001 and found that research on adherence to diabetes Type II medications yields inconsistencies including variability. More research is needed using instruments and different research designs. Variables relating to general measurements such as gender, age, and complexity of treatment are needed as opposed to specific variables (WHO, 2003). The sample size to meet the research design is important for validity of the study to detect significant correlations between the different variables.

The variables used by the research studies included health status, behavioral observations, permanent products, patient self-reports, diaries, and 24 hour recall interviews. These indicators are important in the care of patients with diabetes Type II. The problem with some of indicators is that they attract bias (WHO, 2003). Researchers have shown factors that influence behaviors of diabetes Type II. The WHO (2003) discussed the intrapersonal factors that affect behavior such as age, gender, self-esteem, self-efficacy, stress, depression, and alcohol abuse. The interpersonal factors are important to the well-being of patients. These factors are the quality of communication between the patient, the provider and the patient's social support system. The patient must have some understanding of diabetes Type II, motivating them to adhere to the provider's recommendations and treatment regimen. The WHO discussed the environmental factors, including the high risk situations and environmental systems.

Mann et al. (2009) researched diabetes Type II using a multivariate analysis research design to predict association of medication nonadherence. Using a quantitative method, Mann et al. used 151 participants from the inner city, measuring sociodemographics factors, age, gender, employment, language, ethnicity, and income. Mann et al. added to the variables hbA1C, diabetes history, and comorbidity as reported by the patient. The study used the self-efficacy or regulation theory to base their research. The study was made mainly of African American and Latinos residing in low socioeconomic areas. Sixty-four percent of the participants were born in the United States, and 31% were born in Puerto Rico. The participants reported high levels of comorbidity. The comorbid condition included 80% who had hypertension and 61% of

the participants who had hyperlipidemia. Other comorbid conditions affecting the participants included 43% with depression and 23% with anxiety (Mann et al. 2009). The univariate predictors of medication non adherence were around 28%. These individuals had five beliefs about their diabetes Type II.

1. You only have diabetes when your sugar is high.
2. There are no consequences for poor nonadherence to diabetes Type II medications.
3. Diabetes has no symptoms.
4. They have no control of their diabetes Type II.
5. Diabetes interferes with their regular life.

The patients were divided into four medication beliefs: skeptical 6%, ambivalent 34%, indifferent 5%, and accepting 55%. The skeptical participants were more likely to be nonadherent. The ambivalent participants had a p=0.02, the participants who were indifferent had a p= 0.03, and the participants who were accepting had a p= 0.001 (Mann et al., 2009). Numerous studies have been done on nonadherence. However, nonadherence problems continued to exist. The study emphasis was on the inner city population. Using self-reporting for medication adherence and the sample size prevented accurate associations between the variables. The health education from the participant's point of view was not given in a way they could understand or comprehend what was being taught. The sociodemographic was inconsistent due to variation in study design and target population (Mann et al., 2009).

Mann et al. (2009) found that patients' beliefs were inconsistent in relation to the chronic disease model of diabetes Type II. Patients residing in the inner city had health beliefs predictive of medication nonadherence. Strategies to target these beliefs when working with inner city patients can help setup goals relating to patient health education. Mann et al. encouraged further studies in relation to sociodemographics and other variables relating to anxiety, depression, alcohol abuse, and smoking. Mann et al. pointed out that regardless of the effectiveness of drug therapy, nonadherence continues to be a problem for health care providers. The Morisky scale showed validity and reliability in relation to medication adherence. The Morisky scale is made up of four questions relating to medication. The questions are answered using yes or no. Mann et al. described one example of a Morisky scale question: Do you ever forget to take your medicine? This scale was used by Mann et al. to prove adherence was more accurate than self-reporting by the patient.

White et al. (2011) conducted a quantitative cross-sectional study using bivariate variables, the Spearman correlation coefficient, 15 questions in Spanish, and diabetes Type II specific numeracy measured by a diabetes numeracy test (DNT). The objective of the study was to see if there were any associations between the variables demographics, health literacy, diabetes-specific numeracy, acculturation, self-efficacy, self-care behaviors, and hbA1C levels. White et al. used the DNT to test for reliability and validity of the measurement tool never used in research. The participants of the study were 144 Latinos with diabetes Type II. White et al. further detailed health literacy as opposed to quantitative literacy. Health literacy is described as the ability to understand and process

information provided regarding a person's health to make appropriate decisions relating to health care. In a prior study, 400 English- and Spanish-speaking patients with diabetes Type II had lower health literacy associated with poor outcomes. The participants consisted of 62% females, 81% uninsured patients, 78% of Mexican Nationality, and 96% with low level of acculturation. Quantitative literacy was described as being able to understand and process numbers. Understanding numbers from the authors' perspective meant being able to calculate insulin accurately, count carbohydrates, calculate portion sizes from food labels, and being able to read the glucose meter when testing blood sugar. Patients who showed a low diabetes specific numeracy failed their physician recommendations having poorer outcome and nonadherence. Lower diabetes self-efficacy in Latinos related to a lack of knowledge about diabetes Type II and limited knowledge about numeracy. White et al. used the Spearman correlation coefficient (p) values to test bivariate associations between DNT-15 Latino and sociodemographics, gender, nationality, language, education level, health history regarding diabetes Type II, including insulin. The DNT-15 Latino tool measurement is significantly associated with the construct measurement of health literacy, general numeracy, and diabetes-specific skills. Literacy is closely related to acculturation. Latinos were impacted by lack of acculturation, limiting adoption to health care, knowledge, and beliefs from the main culture (White et al. 2011).

The new measurement tool used by White et al. (2011) lacked validity and reliability. The participants had no understanding of the DNT-15 tool, limiting the association between self-efficacy, self-care behaviors, and insulin use, including

glycemic control. White et al. called the limitations “floor effects” limiting the researchers' ability to accurately determine the correlation between the independent variables. White et al. determined that future research is needed in relation to sociodemographics, self-efficacy and self-care behaviors using a measurement tool that has validity and reliability. The sample size was limited to 144 participants, decreasing the accuracy of the study (White et al. 2011).

White et al. (2011) discovered measurement information relating to glycemic control. White et al. used chart information and glucose testing at patient clinics providing information regarding the patient’s hbA1C. The patient’s cross-sectional study design provided information regarding the association between variables, their limitations, and weaknesses. The study emphasis was on health literacy and numeracy presenting data that can assist providers in understanding the patient’s limitations when conducting blood glucose tests. The information provided by the authors relating to diabetes-specific numeracy and acculturation was important when teaching the patient self-efficacy and self-care behaviors. Knowing that the patient is limited to diabetes-specific skills alerts the provider to encourage health education promoting a better understanding of diabetes Type II disease processes and management (Mann et al., 2009).

Nozaki et al. (2009) conducted a cross-sectional prospective study with stepwise multiple regression analysis using psychological tools to measure the association between psychological factors and glycemic control of participants with diabetes Type II. The study had 304 Japanese participants with diabetes Type II being managed at the outpatient clinics. All participants were required to take the hbA1C test. The participants

were also asked to complete the self-report psychological inventories: Diabetes Treatment Satisfaction Questionnaire (DTSQ), Problem Areas in Diabetes Survey (PAID), Well-Being Questionnaire 12 (W-BQ12), Self-Esteem Scale (SES), Social Support Scale, and Self-Efficacy Scale, and hbA1C measure 1 year later. Data were collected on demographics, age, and medical records. Nozaki et al. (2009) found that there was an association between age; diet management; microvascular problems of diabetes Type II; and the scores from the DTSQ, W-BQ12, PAID, SES, and the self-efficacy scale. According to the stepwise multiple regression analysis, there was an association between the predictors at baseline hbA1C. The patients were followed for 1 year. Two hundred and ninety participants (95.4% of the 304) were assessed after 1 year using the multiple regression analysis. Nozaki et al. (2009) determined that the DTSQ and the PAID predicted a lower hbA1C and medication adherence.

The Nozaki et al. (2009) study had limitations relating to causal relationship between variables tested and glycemic control: a causal model was not used. Self-care and self-management were not correlated to medication adherence. Out of the participants, 14 were not easily followed and four patients passed away. The Nozaki et al. (2009) determined that the 14 patients were probably more dissatisfied with their treatment plan. Nozaki et al. could not determine if there were any differences between sociodemographics clinical or psychosocial variables after 1 year.

The strengths of the Nozaki et al. (2009) study were the correlation between patient satisfaction and hbA1C control. Patient satisfaction denotes a better quality of life. Patients who are satisfied follow the physician’s recommendations and treatment regimen

plan. Nozaki et al. concluded that more regression analysis studies are needed in the future using sociodemographics, age, gender, and quality of life satisfaction.

Boswell, Cook, Burch, Eaddy, and Cantrell (2010) completed a study using original research articles relating to medication adherence, clinical recommendations, economic, and use outcomes. The study included 13 chronic diseases. These diseases were coronary artery disease (CAD), hyperlipidemia, heart failure (HF), hypertension, postmyocardial infarction (post-MI), bipolar disorder, depression, schizophrenia, diabetes Type II, migraine, seizures, asthma, and chronic obstructive pulmonary disease (COPD). The variables of interest as described by the researchers were adherence, costs, outcomes, hospitalization, economics, and Medicaid, including persistence and prescription drugs. The data were collected from 1974-2010. Boswell et al. (2011) reviewed 105 articles dealing with the chronic diseases being evaluated except articles relating to migraine. Boswell et al. (2010) found that most of the articles showed a positive response to medication adherence, 64.3% to 100% depending on the categorical variables and the chronic disease. The highest level of positive outcomes related to post-MI, CAD/hyperlipidemia and schizophrenia. Diabetes, hypertension, and asthma showed a lower positive outcome but higher source of economic and use data.

A limitation to the Boswell et al. (2010) study was based on the lacked of related studies to the identified chronic diseases and limited application of the plan research strategies. These limitations prevented a proper evaluation of medication adherence to diabetes, hypertension, asthma, and COPD. No literature was identified by researchers relating to the adherence of medication for migraines. Another limitation related to a lack

of individual variables dealing with adherence. The study emphasis was based on clinical interventions, use, and economic outcomes. The numerical level system used to label the literature reviewed became complex when there were limitations to the studies found on the chronic disease, such as migraine medication adherence (Boswell et al., 2010). Boswell et al. (2010) pointed out information in relation to the economic burden caused by chronic diseases and the use of these services with poor adherence to medication or physician recommendations. Medication adherence is a predictor of positive clinical outcomes, lower health care cost, and less use of services relating to complications. Boswell et al. recommended further studies related to independent variables that address a specific chronic disease, such as diabetes Type II.

Mainous, Diaz, and Geeze (2008) analyzed data from 1999 – 2004 National Health and Nutrition Examination Survey (NHANES). The NHANES uses a complex, multistage, probability sampling design in selecting participants within the civilian population. Mainous et al. (2008) noted that the survey overly sampled population subgroups to increase the reliability and validity of determining health indicators representative of the population. Mainous et al. (2008) looked at acculturation; healthy lifestyle measures that included obesity, exercise, and diet; demographics characteristics; and access to care. The demographic characteristics were age, sex, poverty-income ratio (<1.0 versus >1.0), education, and access to care. Because of the complexity of the survey, Mainous et al. (2008) used the SUDAAN Statistical software, RTI international, Research Triangle Park, North Carolina to determine the weighting complex sampling design. Bivariate tests were conducted to measure the association between acculturation

by the SAS scores, country of birth, and lifestyle behaviors. Mainous et al. (2008) showed that 36% - 69% of individuals nationally were more acculturated. Latinos with diabetes Type II with less acculturation showed an annual income of less than $20,000 and were less likely to have completed high school. The differences between diet and exercise were similar with the exception that less acculturated individuals exercised less during leisure time. The bivariate analysis on dietary fiber and cholesterol were similar between those who were acculturated and those who had less acculturation. The logistic regression analysis showed that acculturated individuals, as opposed to those who were less acculturated, were nonsmokers. Country of birth was not a strong indicator for a healthier life style; however, Latinos who had acculturated into the main stream had a better opportunity of health care access and better socioeconomic status (Mainous et al., 2008).

The cross-sectional data set from Mainous et al. (2008) limited the results' ability to determine inferences regarding causal effects. Acculturation is significantly associated with many indicators relating to a healthy lifestyle; however, acculturation is a complex determinant due to the belief, values, and behaviors regarding health. The questions regarding physician and patients diagnosed with diabetes Type II does not indicate the recommendations given regarding the type of diagnosed diabetes. The information provided by Mainous et al. (2008) was limited regarding the Latino immigrants' background characteristics. The survey provided limited information in relation to the Latinos' adherence to medications (Mainous et al., 2008). Mainous et al. (2008) provided information in relation to patient access to care, culture, and acculturation in association

to patients with diabetes Type II adapting to new cultural values. Mainous et al. also pointed out that acculturation does not influence smoking or exercise. However, it influences adherence to medication and treatment plans.

Rationale for Selection of the Variables and Concepts

The variables and concepts of this study included nonadherence to diabetes Type II medications among Latinos in Fresno. The intent of the study was to determine predictors of nonadherence to diabetes Type II. It was an attempt to understand the following sociodemographic independent variables: age, gender, income, migrant status, health education, family size. The dependent variable was adherence to medications. The focus of the study was to understand people in their environment and how behaviors affect a person's actions and habits. The study included concepts such as knowledge, skills, and the value placed on beneficial outcomes.

Explanation of Controversial Variables

Inconsistencies regarding the many variables researched were documented by the reviewed researchers. The inconsistencies and limitations were related to sample size, measurements tools used, and methodology design. The limitations in sociodemographic were related to the predictors and the type of specific independent and dependent variables measured. Another limitation was the minority groups that participated in the different studies, including the demographics: inner city versus rural areas. Wroth and Pathman (2006) noted that, regardless of the number of studies done, Latinos' nonadherence to diabetes Type II medications is in a continuum and little is known about why patients fail to follow clinicians' recommendations. Smith (2009) pointed out that

Afro-Caribbean and Latino descent patients are at a higher risk of diabetes Type II. The gap still exists in relation to sociodemographics and diabetes Type II affecting Latinos. The controversy found was in association to the philosophy of the researchers and clinicians. In their database search relating to diabetes Type II and racial ethnic minorities, Peek et al. (2007) found that two thirds of the studies were controlled trials or randomized controlled trials. Peek et al. proposed that more studies are needed relating to patients with diabetes Type II of racial, ethnic minority groups. The characteristics ought to relate to the patient's characteristics, sociodemographics, education, and other variables that relate to the patient's socioenvironment.

Synthesize Studies Related to the Research Question

The research question for the study related to sociodemographic predictors of medication nonadherence among Latinos with diabetes Type II. The review of the literature included only a few similar studies. However, these studies either had a different methodology, few variables, or a limited number of participants. The study related to Latinos with diabetes Type II in the Fresno. In a cross-sectional design study, the WHO (2003) found that medication adherence is related to socioeconomic status and poor communication between patients and providers. Mann et al. (2009) researched diabetes Type II using a multivariate analysis research design. Mann et al. predicted associations of medication nonadherence using a quantitative method of 131 participants. The variables included sociodemographics from the inner city, age, gender, employment, language, ethnicity, income, hbA1C, diabetes history, and comorbidity as reported by

patients. This study is closely related to the present study except with a few different variables and target population.

Recommendations for Other Studies

Fortmann, Gallo, and Phillis-Tsimikas (2012) and Peek et al. (2007) claimed that Latinos are disproportionately affected by diabetes Type II, have a higher prevalence of diabetes Type II, have higher hbA1C, and have an increased number of complications. Fortmann et al. discussed the importance of communication between patients and providers. It is equally important to provide avenues for social and environmental support, including resources required to manage this chronic health condition. Resources to manage diabetes Type II can be used to ensure medication adherence and prevent depression and anxiety. Rustveld et al. (2009) found that self-esteem and a sense of powerlessness can affect Latino American men with diabetes Type II. The data are important when referring Latino male patients to health education and other types of counseling.

Mann et al. (2009) described predictors to diabetes Type II medications. Mann et al. added that the studies have been inconsistent in relation to target population, age, sex, ethnicity, income, education, and comorbidity. Mann et al. found that beliefs about causes and cures for diabetes Type II contribute significantly to the predictors of poor medication adherence. Mann et. also reported the importance of cultural sensitivity when tailoring educational classes to patients with diabetes Type II.

Social Impact Relating to Medication Nonadherence

Horton (2012) described diabetes Type II complications as having a high impact on a patient's quality of life. This quality of life is impacted by diabetes Type II complications, medication nonadherence, depression, limited access to care, and hospitalizations. Horton recommended understanding patients' characteristics, their view of health care, and their understanding of the disease. The health care providers' approach to patients will determine an effective positive outcome, including the patients' social environment and cultural barriers (Horton, 2012).

Cusi and Ocampo (2011) reflected on the importance of health care providers being aware of the need to tailor interventions for the Hispanic/Latino patient. According to Cusi and Ocampo, a gap exists between ethnic minorities in the United States. The Latino individual's genetics is believed to influence diabetes Type II. Cusi and Ocampo found that, in 2009, Latinos had a higher prevalence of diabetes Type II as opposed to Caucasian patients. The prevalence of diabetes Type II for Latinos was 11.8% as opposed to 7.1% for Caucasian individuals. Awareness of patients' needs, cultural beliefs, socioeconomic, and socioenvironmental barriers are important in order to plan interventions appropriate for them. Cusi and Ocampo recommended further studies relating to variables affecting Latino individuals. Improving positive outcomes ought to be the goal for clinicians and physicians. Therefore, adherence to medication, diet, and exercise is the triad for better diabetes Type II outcomes.

Chan (2010) described medications nonadherence as a health care problem, impacting cost for the individual, family, and community. Chan (2010) estimated that

nonadherence is responsible for approximately $100 billion a year in health care costs. Health education is important not only for the health educators but for the health care providers as well to improve diabetes Type II adherences to medications.

The CDC (2011) noted that the cost for diabetes care in the United States in 2007 was $116 billion for medical expenses and an indirect cost of $58 billion for disability, work loss, and premature death. The CDC reported on complications such as heart disease as the cause of death in 68% of diabetes-related death. Strokes were noted to be 16% of diabetes-related deaths. Other complications self-reported by patients with diabetes Type II included hypertension and diabetes. Blindness and eye problems were seen in individuals 20 to 74 years old in 2005 to 2008 during an examination of 4.2 million (CDC, 2011). People with diabetes aged 40 or older had diabetes retinopathy, of these 655,000 had serious type of diabetic retinopathy. Kidney disease was reported on 48,374 people with diabetes (CDC, 2011).

The CDC (2011) reported that, in 2008, 2,002,290 people with diabetes and end-stage kidney disease were living with regular dialysis or kidney transplants. Nervous system diseases were noted in 60% to 70% of individuals. These individuals had mild to severe nervous system diseases including carpal tunnel syndrome, impaired sensation, or pain in their feet. Erectile dysfunction and other nerve problems were noted as well. The CDC reported that, in 2006, 65,700 nontraumatic lower limb amputations were performed.

Another problem with diabetes Type II is dental disease. Sanders-Polin (2012) described periodontal gum disease as a problem with diabetics. Nonadherence to diabetes

Type II medications increases the problem of periodontal gum disease due to poor glycemic control and vascular disease that affects nutrition responsible for the destructive inflammation of the gums. Poorly controlled diabetes Type II is the reason for the development of periodontal gum disease. Fried (2012) described the risk factors of periodontal disease that applies to many disorders including diabetes Type II. Individuals with diabetes Type II have a higher risk of developing gingivitis and periodontal disease. Periodontal disease impacts society, and patients. The literature was not specific to the cost to treat and manage diabetics with periodontal disease. However, Persson (2011) noted that periodontal disease is the sixth known complication for patients with diabetes Type II. The treatment of periodontal disease is associated with positive outcomes. Persson found that a person with diabetes Type II who is treated for periodontitis and has a hbA1C > 9.0% has an opportunity to decrease their hbA1C to 0.6% with no change in medication adherence, and patients with medication adherence have an opportunity to decrease their hbA1C to 1.4%. There is sufficient evidence that supports the impact of periodontal disease on systematic inflammation indicators (Persson, 2011).

Literature Reviewed on Social Change

There is a consensus among the investigators on medication adherence to prevent diabetes Type II complications. Nonadherence to medications is multifactorial in relation to race/ethnicity in minority groups. Latinos have many problems to overcome such as limited resources, limited access to care, and position value, including how the person views health. The benefits to medication adherence include glycemic control, less complications, better quality of life, increased productivity, decreased premature deaths,

and decreased disabilities related to diabetes Type II complications. The financial burden to health care will be decreased and patients with diabetes Type II will have an opportunity for patient satisfaction, decreasing depression, anxiety, and improved self-esteem. The study will impact social change by improving patients' diabetes Type II medication adherences and providing information to other health care providers about the importance of ensuring that Latino patients understand the recommendations. I aimed to improve policies at the state and community level relating to Latino patients barriers to medication adherence, including diet and exercise, by looking for associations among predictors specific to Latinos with diabetes Type II and nonadherences to medications.

Swan (2010) explained that helping patients understand their barriers to diabetes management is important in preventing said barriers. Understanding why patients are not able to self-manage their diabetes is important for the patient, the family, and the health care provider. The independent predictors of nonadherence in this study were age, gender, income, migrant status, family size, and health education for patients with diabetes Type II. These variables were analyzed to help providers of care in understanding the factors associated with adherence. The social impact in decreasing cost, complications, improving quality of life, and patient satisfaction for both males and females is important to stockholders who finance health care for the uninsured, insurance payers, and state, including patients and families. The findings of this study could well assist in changing or improving national policies in relation to self-management of Latinos with diabetes Type II.

Summary and Conclusions

This chapter included a description of diabetes Type II medication adherences versus nonadherence and research studies conducted to improve the management of diabetes Type II worldwide. The literature reviewed was a summary of the methodologies and designs used in the research studies, including the intervention conducted by different researchers to address the problem of nonadherences to medications. The review also included several theories relating to causes of diabetes Type II. The reviewed researchers suggested that social and environmental behaviors are contributing factors to diabetes Type II nonadherences. I also reviewed prior interventions to improve medication adherence through active patient participation and health education, diet, and exercise

Chapter 3 will include detailed description of the methodology and research design, sample size requirements, participant recruitment, data analysis, and ethical considerations.

Chapter 3: Research Method

Introduction

A quantitative retrospective research study was conducted to understand the association between medication nonadherence among Latinos with diabetes Type II and the independent variables that included age, gender, income, migrant worker status, family size, and health education. These sociodemographic variables were used to predict an association to diabetes Type II medication adherence among Latinos. The dependent variable was adherence to diabetes Type II medications. A logistic regression analysis was used to quantify the association between variables.

This chapter is divided into four sections. The introduction contains the description and purpose of the study. The research design and rationale connect the research questions with the research design. I define the research study, detailing the population, the sampling size, and how the information was collected when using archival data. It also contains the data analysis plan and how the data were interpreted. The methodology section includes a description of the power size, using the alpha level and power level of choice. The sections on threats to validity contain internal threats to validity, history, and statistical regression.

Research Design and Approach

This quantitative retrospective method design study was used to determine if there is an association between geographic characteristics of Latinos and the adherence to diabetes Type II medications. These characteristics included age, gender, income, migrant worker status, family size, and health education. The retrospective design was

used because the data were entered into database files at Clinica Sierra Vista, Fresno, California. Therefore, because the files contained existing data, the analysis was considered secondary. The archived database files at Clinica Sierra Vista are linked to i2i Media Tracks that services eight clinics from rural, suburban, and urban impoverished areas of the city. The data were pulled from January 2006 to December 2011 from the eight community health care center clinics. A series of bivariate analyses were conducted for each of the independent variables, determining an association between the independent variables and the dependent variable. A multivariate analysis was conducted to determine if combinations of significant variable together formed a strong predictor than the variable alone.

Methodology

Target Population

The target population was limited to Latinos from eight clinics across Fresno, California with diabetes Type II. The general characteristics of the target population included individuals living in impoverished areas of the city, with limited resources, limited education, and income. The target population was comprised of a minimum of 111 Latino patients as calculated using G*Power in the sample size and power calculation, see Selection of Participants below. The sample size was increased to 200 for oversampling. The ages of the participants were 18 years of age or older, males and females, who were working mainly as field workers. The i2i Media-Tracks database contains over 14,000 entries with information regarding medications, laboratory results, examinations, social and medical history, including random blood sugars or fasting blood

sugar performed during the medical visit. The 200 patients were selected from the database using a random number generator with a minimum of one and a maximum of 14,000.

Selection of Participants

The data were collected using secondary electronic medical record review. The participants were Latinos with diabetes Type II. The inclusion and exclusion criteria for qualifying patients from which data were gathered was males and females, 18 years of age or older, with diabetes Type II, patients of Clinica Sierra Vista, Community Health care Clinics, English- or Spanish-speaking. Patients were excluded if they had diabetes Type I, gestational diabetes, or diabetes insipidus. The retrospective quantitative research study data will be pulled from January 2006 to December 2011 for patients with at least 1 year of diagnosis and treatment.

Sample Size and Power Calculation

The research study involved the use of one logistic regression and six independent variables. An effect size of 0.3 (medium) is generally an accepted range with a power of 0.95 and an alpha of 0.01 after applying the Bonferroni adjustment (Franz, Edgar, Albert-Georg, Axel, & Buchner, 2009). Given those values, the desired sample size to achieve empirical validity for the logistic regression with five predictors was a minimum of 111 patients as calculated using the G*Power 3.1.7 calculator. A total of 200 patients were used as an oversampled size. LeBlanc and Fitzgerald (2009) described power as the probability that the results of the study will provide statistical analysis actions to evaluate

the hypotheses. Sample size is calculated using power to determine if the results are statistically significant (Franz et al., 2009).

Characteristics of Selected Data

The database files at Clinica Sierra Vista are linked to i2i Media Tracks that services eight clinics from rural, suburban, and urban impoverished areas of the city. The data were entered into IBM SPSS Statistics Software (Version 21). Descriptive statistics were conducted to describe the sample demographics, the research independent variables, and the dependent outcome variable nonadherence to medication among Latinos with diabetes Type II. Latinos were identified by race as specified in the demographics. Nonadherence was defined as a failure to comply with medication as prescribed, which included failure to take and/or refill their medication within at least a 6 month time frame. The data were collected from the electronic Medication record database files linked to the i2i Media Track or NextGen database. Frequency and percentages were calculated for gender, income, health education, family size, and migrant worker status by nonadherence to medications. Mean and standard deviations were calculated for age by nonadherence to medications. Depending on the predictors, an outcome action plan with recommendations to patient management and adherence to diabetes Type II medications was prepared. Results of the data analysis will be presented to both clinicians and staff in order for them to encourage patients to enter medication assistant programs, including free medication pharmaceutical programs available to patients with limited income.

Data Analysis

The intent of the study was to determine if there are predictors of nonadherence to diabetes Type II medications using a quantitative method design. The objective of this research study was to understand the association between sociodemographic independent variables: age, gender, income, migrant worker status, family size, and health education. The dependent variable was adherence to medications among Latinos with diabetes Type II. A bivariate analysis for each independent variable was tested to see if there was an association between the independent variable and the dependent variable. The multivariate analysis method was used to identify strong predictor values of any combination of two independent variables in relation to diabetes Type II among Latinos.

A logistic regression was conducted and is appropriate when the criteria variable is dichotomous with two possible outcomes. One variable can estimate the possibility of an event's occurrence (Stevens, 2009). The dependent variable in this analysis was adherence to medications determined by whether or not a patient had refilled their medication within at least a 6 month time frame. The possible predictor variables tested in the analysis were age, gender, income, migrant worker status, family size, and health education. A logistic regression analysis can be used when the predictor variables are continuous, discrete, or a combination of continuous and discrete. Age was treated as a discrete variable, divided into four categories: *1=18 to 30 years of age, 2=31 to 45 years of age, 3=46 to 60 years of age,* and *4=61 and older*. Gender was categorized as males versus females, health education, yes versus no, and migrant worker status yes versus no. These were treated as dichotomous variables. Health education was determined by

whether or not the patient took diabetes Type II health education classes. Income was categorical dummy coded by the following classification *0= none, 1=$1 to $10, 000 per year, 2=$10,001 to $15,000 per year, 3=$15,001 to 20,000 per year,* and *4=$20,001 or more*. Family size was defined by the number of persons per household.

The logistic regression analysis permits the evaluation of the odds of membership in adherence versus nonadherence based on the combination of predictor variables. Overall model significance or the Omnibus test of model coefficients for the logistic regression was examined by the effect of the predictor variables on adherence to medication and were presented with an X^2 coefficient. The Cox and Snell R^2 and Nagelkerke R^2 were used to examine the percent of variance accounted for the predictor variables. Predicted probabilities of an event occurring were determined by the odds ratio, Exp (β; Tabachnick & Fidell, 2012).

Logistic regressions overcome many of the restrictive assumptions of linear regressions. Linearity, normality, and equality of variances are not assumed, nor is it assumed that the error term variance is normally distributed. The major assumption of the logistic regression is that the outcome variable must be discrete. The data should not contain outliers, and there should be a linear relationship between the odds ratio and the predictor variables (Tabachnick & Fidell, 2012). If there are any outliers, they should be analyzed to determine if they represent unusual circumstances or if they are due to patient error. Linearity with an ordinal or interval predictor variable and the odds ratio can be checked by creating a new variable that divides the existing predictor variable into categories of equal intervals and running the same regression on these newly categorized

versions as categorical variables. Linearity is demonstrated if the B coefficient increases or decreases the linear steps (Garson, 2009). Finally, a large sample is recommended fitting with the maximum likelihood method; using discrete variables requires that there are enough responses in each category. Table 1 will present the inclusion and exclusion criteria for qualifying patients.

Table 1

Inclusion and Exclusion Criteria for Qualifying Patients From Which Data Were Gathered

Inclusion	Exclusion
1. Patient of Clinical Sierra Vista	1. Patients with diabetes type I
2. Patients 18 years of age or older	2. Patients with gestational diabetes
3. Patients with diabetes type II	3. Diabetes insipidus
4. English or Spanish Speaking	

Variables, Descriptions, and Measurements

Inferential statistics were used to predict an association between the independent variables and the dependent variable: adherence to medications among Latinos with diabetes Type II. The omnibus test of coefficients for the logistic regression was examined by the effect of the predictor variables on adherences to medication and was presented with an X^2 coefficient. The data collected related to Latinos, which are defined as Mexican American, Mexican Migrant workers, Central American, South American, Puerto Ricans, Cubans, Portuguese, or any individual with a Hispanic background. The data were limited to patients who had identified their race as being Latino.

The data were entered into a SPSS version 21.0 for Windows. Descriptive statistics was conducted to describe the sample demographics and the research variables. Frequency and percentages were calculated for gender, income, health education, family size, and migrant worker status by adherence to medications. Means and standard deviations were calculated for age and income by nonadherence to medications. Screening of the data followed a statistical frequency distribution with cross tabulation (Broeck, Cunningham, Eeckels, & Herbst, 2005).

Inferential Statistics

All variables were examined using the overall model of significance, or the omnibus test of model coefficient, for the logistic regression and examined by the effect of the predictor variable on adherence to medication and were presented with an X^2 coefficient. The Cox and Snell R^2 and Nagelkerke R^2 were used to examine the percentage of variances accounted for by the Exp (β; Tabachnick & Fedell, 2012). The linearity with an ordinal, odds ratio and interval was used to determine if the B coefficient increases or decreases with the maximum likelihood method.

Bivariate Analysis

Bivariate analyses, followed by multivariate analysis, were conducted to determine an association between the independent variables and the dependent variable of nonadherence to medications. The independent variables were gender, age, income, health education, family size, and migrant worker status. The analyses were done in order to answer the question:

RQ1**:** Are there predictors of nonadherence to medications among Latinos with diabetes Type II?

$H_0$1: There is not an association between age and nonadherence to medications among Latinos with diabetes Type II.

H_a1: There is an association between age and nonadherence to medications among Latinos with diabetes Type II.

$H_0$2: There is not an association between gender and nonadherence to medications among Latinos with diabetes Type II.

H_a2: There is an association between gender and nonadherence to medications among Latinos with diabetes Type II.

$H_0$3: There is not an association between income and nonadherence to medications among Latinos with diabetes Type II.

H_a3: There is an association between income and nonadherence to medications among Latinos with diabetes Type II.

$H_0$4: There is not an association between migrant workers and nonadherence to medications among Latinos with diabetes Type II.

H_a4: There is an association between migrant workers and nonadherence to medications among Latinos with diabetes Type II.

$H_0$5: There is not an association between family size and nonadherence to medications among Latinos with diabetes Type II.

H_a5: There is an association between family size and nonadherences to medications among Latinos with diabetes Type II.

$H_0$6: There is not an association between health education and nonadherence to medications among Latinos with diabetes Type II.

H_a6: There is an association between health education and nonadherence to medications among Latinos with diabetes Type II.

Table 2

Diabetes Type II Medication Nonadherence Independent Predicted Bivariate Variables Null and Alternative Hypothesis (N=200)

Hypothesis	Concept	Name of variable	Possible outcome
*Ho*1: There is not a statistically significant association between age and medication nonadherence among Latinos with diabetes type II. *Ha*1: There is a statistically significant association between age and medication nonadherence among Latinos with diabetes type II.	Adherence to diabetes type II medications in relation to age groups.	Continuous predictor is Age	An association might exist between age and medication non adherence in relation to Latinos with diabetes type II
*Ho*2: There is no statistically significant association between gender and medication nonadherence among Latinos with diabetes type II. *Ha*2: There is a statistically significant association between gender and medication nonadherence among Latinos with diabetes type II.	Adherence to diabetes type II medication for both males and females	The predictor variable is gender	There is or is not an association between gender in relation to adherences to diabetes type II medications among Latinos
*Ho*3: There is no statistically significant association between income and nonadherences to diabetes type II medication *Ha*3: There is a statistically significant association between income and nonadherences to diabetes type II medications	Medication adherence to diabetes type II regardless of income	The predictor variable is income	There is or is not an association between income and medication nonadherence among Latinos with diabetes type II.
*Ho*4: There is no statically significant association between migrant worker status and nonadherences among Latinos with diabetes type II. *Ha*4: There is a statistically significant association between migrant worker and nonadherences among Latinos with diabetes type II.	Medication adherence to diabetes type II in relation to migrant worker status	The predictor variable is migrant worker status	There is not a strong association between migrant worker status and nonadherence to diabetes type II medications among Latinos

Hypothesis	Concept	Name of variable	Possible outcome
*Ho*5: There is no statistically significant association between family size and nonadherences among Latinos with diabetes type II. *Ha*5: There is a statistically significant association between family size and nonadherences among Latinos with diabetes type II.	Medication adherence to diabetes type II in relation to family size.	The predictor variable is family size	There is or is not an association between family size and adherences to diabetes type II medications
*Ho*6: There is no statistically significant association between health education and nonadherences among Latinos with diabetes type II. *Ha*6: There is a statistically significant association between health education and nonadherences among Latinos with diabetes type II.	Medication adherence to diabetes type II in relation to health education.	The predictor variable is health education	There is or is not an association between health education and adherences to diabetes type II medications

Multivariate Analysis

A multivariate analysis method was used to test the association between medication nonadherence and a combination of two predictors to diabetes Type II among Latinos.

RQ2**:** Is there a combination of predictors to nonadherence to medications among Latinos with diabetes Type II?

$H_0$7: The combination of age and gender is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a7: The combination of age and gender is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$8: The combination of migrant workers and income is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a8: The combination of migrant workers and income is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$9: The combination of age and health education is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a9: The combination of age and health education is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$10: The combination of income and family size is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a10: The combination of income and family size is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$11: The combination of gender and health education is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a11: The combination of gender and health education is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

Table 3

Multivariate Variables (N=200)

Hypotheses	Concept	Name of variable	Possible outcome
Ho7: There is not a strong association between the combination of age, gender and adherence to diabetes type II medications. *Ha7:* There is a strong association between the combination of age, gender and adherence to diabetes type II medications	Age and gender in relation to adherence to diabetes type II medications.	The combination variables are age and gender.	There is or is not a strong association between diabetes type II and a combination of age and gender among Latinos.
Ho8: The combination of migrant workers status and income are not strong predictors to adherence of diabetes type II medications. *Ha8:* The combination of migrant workers status and income are strong predictors to adherence of diabetes type II medications.	Adherence to diabetes type II medications in relation to migrant worker status and income.	The combination predictor variables are income and migrant worker status.	There is or is not a strong predictor value associated with nonadherence to diabetes type II among Latinos.
Ho9: Health education and age are not strong predictors to diabetes type II medication adherences. *Ha9:* The combination of health education and age are strong predictors to diabetes type II medication adherences.	Health education and age in relation to diabetes type II medications.	The combination predictor variables are health education and age.	There is or is not a strong predictor value of the combined variables associated with adherences or nonadherences.
Ho10: Family size and income are not strong predictors to diabetes type II medication adherences. *Ha10:* Family size and income are strong predictors to diabetes type II medication adherences.	Family size and income in relation to diabetes type II medications.	The combination predictor variables are family size and income.	There is or is not a strong predictor value of the combined variables associated with adherences or nonadherences. *Table Continues*

Ho11: Gender and health education are not strong predictors to diabetes type II medications adherences. *Ha11:* The combination of gender and health education are strong predictors to diabetes type II medication adherences	Gender and Health education in relation to diabetes type II medications.	The combination predictor variables are gender and health education	There is or is not a strong predictor value of the combined variables associated with adherences or nonadherences.

The independent variables were age, gender, income, health education, family size, and migrant worker status as predictors to medications nonadherence to be self-completed and self-reported. These forms included personal information, demographics, resources, and medical history. The PSR are available to assist patients who speak languages other than English by providing translators. The information collected was stored using "i2i Media Tracks." The staff is trained to treat the data collected with the upmost sensitivity and confidentiality, regardless of patient's insurance or income status. The patient's information is maintained using the Health Insurance Portability and Accountability Act of 1996. The data are self-reported by the patient at the time of the medical visit. Once the information is in the system, the data are updated at time of each recurrent visit by the trained staff at Clinica Sierra Vista in Fresno, California.

Table 4

Omnibus Test of Model Coefficient Using SPSS

		Chi-Square	*df*	Sig
Step 1	Step	Numbers	5	.000
	Block	Numbers	5	.000
	Model	Numbers	5	.000

Table 5

Model Summary

Step	.2 Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
1	Numbers	Numbers	Numbers

Table 6

Variables in Model

		B	*SE*	Wald	*df*	Sig	Exp (β)
Step 0	1	( )	( )	( )	1	( )	( )

Data Analysis Matrix

The data are stored on servers at Clinica Sierra Vista. The "i2i Media Tracks" contains over 14, 000 active patients suffering from diabetes Type II. The majority of the population was Latinos from the different areas of Fresno. There are eight clinics in Fresno servicing the community. A letter permitting use of Clinica Sierra Vista data files were authorized by the administrators (see Appendix A). The administrators have been helpful as long as patient confidentiality is maintained. See Table 7:

Table 7

Analysis Matrix for the Quantitative Retrospective Research Study Between Medications Nonadherences Among Latinos With Diabetes Type II (N = 200)

Study	Concept	Data	Measurement	Data analysis and statistics
I	Study of population adherences to diabetes type II medications	Medical chart review and electronic medical record review	Ordinal, quantitative, dichotomous, continuous, categorical	Mean, standard deviation, percentage and frequency
I.1	Study of demographics of individuals in relation to adherence to diabetes type II medication	Medical chart review and electronic medical record review	Ordinal, quantitative, dichotomous, continuous, categorical	Mean, standard deviation, percentage and frequency
I.2	Study of a combination of demographics in relation to adherence to diabetes type II medication	Medical Chart review and electronic medical record review	Ordinal, quantitative, dichotomous, continuous, categorical	Mean, standard deviation, percentage and frequency

Threats to Validity

The use of quantitative retrospective design archive data leads to threats to external validity (Garcia-Perez, 2012). Gathering the right sample is important in order to determine the accuracy of the population with diabetes Type II among Latinos. Historical accuracy of the data collected will decrease the threat to external and internal validity, increasing the reliability of the data. Therefore, the research study reliability will improve the possibility of providing programs to help Latinos with diabetes Type II in Fresno, California.

Statistical regression is a possible threat to interval validity with a nonrandom sample, such as in the case of secondary data analysis and two measurements that have no association. In this phenomenon, the statistical regression occurs causing a threat to the internal validity and reliability of the study (Weisstein, 2013). Accuracy of the data may also be skewed by the possibility of patients providing inaccurate data due to reasons such as distractions from other patients in the same room, feeling rushed in order to see a physician sooner, and trying to protect their reputation in their community.

Ethical Procedures

Clinica Sierra Vista provided a letter granting access to the archival data on September, 2012. The letter was signed by the deputy chief of programs and by the chief administrative officer, permitting the use of the aggregate data containing over 14,000 active patients suffering from diabetes Type II. The database contains a lot of data with multiple variables including, but not limited to patients' demographics, principal language spoken at home, and income. Clinica Sierra Vista as a stakeholder was committed to the success of the research study. See permission letter (Appendix A). All data were recognized as requiring confidentiality under the Health Insurance Portability and Accountability Act (HIPAA) and the National Institute of Health (NIH) web-based training course Protecting Human Research Participants (Appendix B) certificate of completion dated 9/24/2011. This requirement was met fully including Clinica Sierra Vista policies and procedures relating to patient confidentiality. The data gathered did not include names of patients pulled for research. All identifiers were removed from the database. The data were collected from the "i2i media tracks" electronic medical records.

Walden University requirements were met. The data collected were archived data from Clinica Sierra Vista database files. There was no risk to the participants. No data analysis was performed or collected without the IRB approval. Once permission was given, the data were entered into the electronic SPSS software. Once the data were entered, it will be managed with the outmost integrity and accuracy and deleted after 6 years using a Zip archive folder to protect the files. I submitted an IRB application as per university regulations. Data was collected after given IRB approval to conduct the study (Walden IRB approval number is 02-26-14-0182422).

Summary

Chapter 3 contains information relating to the research design, the methodology, the population, sample size, and data collection. The chapter also includes information regarding internal as well as external threats to validity, accuracy, and data integrity. Another area discussed in this chapter relates to permissions and requirements when working with archived data, protection of human subjects, and IRB approval for data analysis. Chapter 4 will include the data collection, analysis, and interpretation of the data.

Chapter 4: Results

Introduction

The purpose of the research study was to understand the barriers to medication nonadherence among Latinos with diabetes Type II using the independent variables of age, gender, income, migrant worker status, family size, and health education. These sociodemographic variables may predict an association to diabetes Type II medication adherence among Latinos (the dependent variable). The research questions and hypotheses were as follows:

RQ1**:** Are there predictors of nonadherence to medications among Latinos with diabetes Type II?

$H_0$1: There is not an association between age and nonadherence to medications among Latinos with diabetes Type II.

H_a1: There is an association between age and nonadherence to medications among Latinos with diabetes Type II.

$H_0$2: There is not an association between gender and nonadherence to medications among Latinos with diabetes Type II.

H_a2: There is an association between gender and nonadherence to medications among Latinos with diabetes Type II.

$H_0$3: There is not an association between income and nonadherence to medications among Latinos with diabetes Type II.

H_a3: There is an association between income and nonadherence to medications among Latinos with diabetes Type II.

$H_0$4: There is not an association between migrant workers and nonadherence to medications among Latinos with diabetes Type II.

H_a4: There is an association between migrant workers and nonadherence to medications among Latinos with diabetes Type II.

$H_0$5: There is not an association between family size and nonadherence to medications among Latinos with diabetes Type II.

H_a5: There is an association between family size and nonadherence to medications among Latinos with diabetes Type II.

$H_0$6: There is not an association between health education and nonadherence to medications among Latinos with diabetes Type II.

H_a6: There is an association between health education and nonadherence to medications among Latinos with diabetes Type II.

RQ2**:** Is there a combination of predictors to nonadherence to medications among Latinos with diabetes Type II?

$H_0$7: The combination of age and gender is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a7: The combination of age and gender is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$8: The combination of migrant workers and income is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a8: The combination of migrant workers and income is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$9: The combination of age and health education is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a9: The combination of age and health education is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$10: The combination of income and family size is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a10: The combination of income and family size is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

$H_0$11: The combination of gender and health education is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

H_a11: The combination of gender and health education is a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

Chapter 4 is divided into four sections. The introduction contains a brief description of the purpose, research questions, and hypotheses. The data collection includes the timeframe, variables, and types of analysis that was done. The results include data analysis and findings consisting of descriptive and inferential statistics. The results include bivariate and multivariate analysis. In the summary, I answer the research question and prescriptive material.

Data Collection

The study was a quantitative retrospective data method design. I conducted a secondary data analysis performed from the database files at Clinica Sierra Vista linked to i2i Media Tracks that serves eight clinics from rural, suburban, and urban

impoverished areas of the city. The data gathered were from 2010 to 2014. The data were collected and analyzed between March and May 2014. The data were analyzed to understand the association between the sociodemographic independent variables of age, gender, income, migrant status, family size, and health education, including the dependent variable adherence to medications among Latinos with diabetes Type II. A bivariate analysis for each independent variable was tested to see if there was an association between the independent variables and the dependent variable. The multivariate analysis method identified strong predictor values of any combination of the six independent variables in relation to diabetes Type II among Latinos. The original plan was to analyze data varying from 2008 to 2012; however, I found that there were insufficient electronic data available prior to 2010. The number of patients from 2008 and 2009 combined were less than 40; however, it was specified that 40 patients per year over a 5-year span was necessary to equate to 200 patients for this study. Therefore, the study was adjusted to include data spanning from 2010 to 2014. As the data were analyzed, it was noted that family size could have had an impact on how income is dispersed within a household. Family size was thus added as an additional independent variable.

Study Sample

Descriptive statistics analysis was conducted to describe the sample demographics and the research variables. Frequency and percentages were calculated for age, gender, income, health education, family size, and migrant worker status by nonadherence to medications. Means and standard deviations were calculated for age and income by

nonadherence to medications. Screening of the data followed a statistical frequency distribution with cross tabulation (Broeck et al., 2005).

Results

The frequencies and percentages related to diabetes Type II from highest to lowest by age was 46 to 60 years of age, 31 to 45 years of age, 60 years and over, and 18 to 30 years of age. Diabetes Type II was less frequent among younger people in the sample. The distribution of the subjects with diabetes Type II by gender was females 70% and males 30%. Frequencies of patients with diabetes Type II by the independent variable income was described from highest to lowest $1.00 to $10,000, followed by $10,001 to $15,000, $20,001 and over, and lastly $15,001 to $20,000. The frequency of income could be affected by the fact that the majority of residents of Fresno County are impoverished and under the federal poverty level according to the 2012 guidelines. Specifically, 79.5% of patients were migrant workers versus 20.5% who were not. This correlates with frequencies of income; migrant workers tend to be more impoverished. I found that 65.5 % of patients took health education classes whereas 34.5% did not. Patients' family size ranked highest to lowest were families with two to four members, one member, and five or more members in the home. Table 8 presents the demographics of the population.

Table 8

Frequency and Percent Distribution of Selected Demographic Characteristics of the Study Subjects Using the SPSS (N = 200)

Category	Frequency	Percentage
Age		
18-30	7	3.5
31-45	51	25.1
46-60	92	46.0
61-over	50	25.0
Total	200	100
Gender		
Males	60	30
Females	140	70
Total	200	100
Income		
1-10,000	86	43.0
10,000-15,000	57	28.0
15,001-20,000	19	9.5
20,000+	38	19.0
Total	200	100
Migrant worker status		
Yes	159	79.5
No	41	20.5
Health education		
Yes	131	65.5
No	69	34.5
Total	200	100
Family size		
1	69	34.5
2 - 4	92	46
5 and up	39	19.5
Total	200	100

Rates of medication nonadherence for patients diagnosed with diabetes Type II among Latinos were almost evenly distributed as 53.5% who adhered versus 46.5 % who did not adhere among Latinos with diabetes Type II. See Table 9 and Table 10:

Table 9

Frequency and Percent Distribution of Medications Nonadherence Among Study Subjects (N = 200)

	Frequency	Percentage
Medication nonadherence		
No	93	46.5
Yes	107	53.5
Total:	200	100.0

Table 10

Bivariate Omnibus Test Results Using SPSS (N=200)

	df	X^2	Cox & Snell R^2	Nagelkerke R^2	*P*	*OR*
Age & nonadherence	4	.279	.001	.002	.598	.911
Gender & nonadherence	1	7.734	.038	.051	**.005***	.413
Income & nonadherence	4	.001	.000	.000	.982	1.003
Migrant worker & nonadherence	1	.001	.000	.000	.982	1.008
Health education & nonadherence	1	4.510	.022	.030	**.034***	1.900
Family Size & nonadherence	3	.952	.005	.006	.329	.869

Note. Odds ratios were calculated using a 95% confidence interval. An alpha level of 0.05 was used

*****Shows a moderate association to nonadherence to medications among Latinos with diabetes Type II.

Research Question 1

1. Are there predictors of nonadherence to medications among Latinos with diabetes Type II?

The odds ratio for the association between age and nonadherence to medications was calculated to 0.911 with a *p* value of 0.598. For the age group 18 to 30 years, 85.7% of patients did not adhere and 14.3% adhered to medications (*n* = 7; 3.5%). For the age group 31 to 45 years, 53.9% showed nonadherence to diabetes Type II medications and 47.1% adhered to medications (*n* = 51; 25%). Patients between the ages of 46 to 60 had an adherence rate of 50% and a nonadherence rate of 50% to medications (*n* = 92;

25.5%). Patients 60 years of age and older showed an adherence of 44% and a nonadherence rate of 56% to medications (n = 50; 25.0%). I accepted the null hypothesis because the p value is significantly greater than 0.05. There is not an association between age and nonadherence to medications among Latinos with diabetes Type II.

The odds ratio for the association between gender and nonadherence to diabetes Type II medications among Latinos was calculated to 0.413 with a p value of 0.005. Because the p value calculated is less than 0.05, I rejected the null hypothesis. There is an association between gender and nonadherence to medications among Latinos with diabetes Type II.

The odds ratio for the association between income and nonadherence to diabetes Type II medications among Latinos was calculated at 1.003 with a p value of 0.982. Income was divided into four categories. The categories were chosen starting at $1 to $10,000 and incrementing $5,000 per category to represent the 2012 Federal Poverty Measurements of the impoverished areas in Fresno County. The first category $1 to $10 000 showed adherence of 47.7% and nonadherence of 52.3% (n = 86; 43%). The second category $10,000 to $15,000 showed a medication adherence of 42.1 % and nonadherence of 57.9% (n = 57; 28.5%). The third category $15,000 to $20,000 showed a statistical analysis of medication adherence of 57.9% and a medication nonadherence of 42.1% (n = 19; 9.5%). The fourth category included $20,000 and over and showed statistical analysis for medication adherence of 44.7% and nonadherence of 55.3% (n = 38; 19%). The p value calculated greater than 0.05. Therefore, I accepted the null

hypothesis. There is no association between income and nonadherence to medications among Latinos with diabetes Type II.

The odds ratio in association to migrant worker status and nonadherence to diabetes Type II medications among Latinos with diabetes Type II was calculated to 1.008 with a *p* value of 0.982. The *p* value calculated greater than 0.05. Therefore, I accepted the null hypothesis. There is not an association between migrant worker status and nonadherence to medications among Latinos with diabetes Type II.

The odds ratio in association to family size and nonadherence among Latinos with diabetes Type II calculated to 0.869 with a *p* value of 0.329. Family size was grouped by individuals per household. Groups were divided as one person, two to four persons, and five or more persons. A family size of one had a medication adherence of 42% and a medication nonadherence of 58% (*n* = 69; 34.5%). A family size of two to four persons had a medication adherence of 48% and a medication nonadherence of 52% (*n* = 92; 46%). A family size of five or more had a medication adherence of 51% and a medication nonadherence of 49% (*n* = 39; 19.5%). The *p* value is greater than 0.05. Therefore, I accepted the null hypothesis. There is no association between family size and nonadherence to medications among Latinos with diabetes Type II.

The odds ratio in association to health education and nonadherence to diabetes Type II medications calculated to 1.900 with a *p* value of 0.034. The *p* value is less than 0.05. Therefore, I rejected the null hypothesis. There is an association between health education and nonadherence to medications among Latinos with diabetes Type II. See Table 11:

Table 11

Multivariate Omnibus Test Results for all Variables Using SPSS (N=200)

	Df	*p*	*OR*
Age	4	.745	1.063
Gender	1	.012	2.301
Income	4	.995	1.001
Migrant worker	1	.967	1.015
Health education	1	.049	.538
Family size	3	.329	.869
Constant	1	.237	.441

Table 12

Multivariate Omnibus Test Results for Combinations of Variables (N=200)

	df	Wald	X^2	Cox & Snell R^2	Nagelkerke R^2	*p*	*OR*
Age, gender & nonadherence	2	.064 7.191	7.798	.038	.051	**.020***	.955 .417
Migrant worker, income & nonadherence	2	.001 .001	.001	.000	.000	.999	1.003 1.009
Age, health education & nonadherence	2	.261 4.397	4.771	.024	.031	.092	.912 1.898
Income, family size & nonadherence	2	.219 1.165	1.172	.006	.008	.323	.937 1.265
Gender, health education & nonadherence	2	6.991 3.998	11.809	.057	.077	**.003***	.420 1.862

Note. Odds ratios were calculated using a 95% confidence interval. An alpha level of 0.05 was used.*****Shows a strong association to nonadherence to medications among Latinos with diabetes Type II. Odds ratios were calculated using a 95% confidence interval.

Research Question 2

2. Is there a combination of predictors to nonadherence to medications among Latinos with diabetes Type II?

The combination of age and gender is a strong predictor to nonadherence to medications among Latinos with diabetes Type II. The odds ratio was calculated at 0.955 and gender at 0.417 with a *p* value of 0.020. Because the *P* value is less than 0.05, I rejected the null hypothesis. The combination of age and gender is a strong predictor to diabetes Type II medications among Latinos.

The odds ratio between migrant worker status and income as a predictor to medication nonadherence among Latinos with diabetes Type II was calculated at 1.009 for migrant workers and at 1.003 for income with a *p* value of 0.999. The *p* value is greater than 0.05. Therefore, I accept the null hypothesis. There is not a strong association between migrant worker status and income associated with diabetes Type II among Latinos.

The odds ratio for the combination of age and health education was calculated at .912 for age and 1.009 for health education with a *p* value of 0.092 greater than the normal *p* value of 0.05. Therefore, I accepted the null hypothesis. The combination of age and health education is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II.

The combination of income and family size is not a strong predictor of nonadherence to medications among Latinos with diabetes Type II. The odds ratio was calculated for income at 0.937 and at 1.265 for family size with a *p* value of 0.323 greater than the normal *p* value of 0.05. Therefore, I accepted the null hypothesis. There is no association between the combination of income and family size and nonadherence to medications among Latinos with diabetes Type II.

The odds ratio for the combination of gender and health education was calculated at 0.420 for gender and 1.862 for health education with a *p*. value of 0.003. Because the value is less than the normal *p* value of 0.05, I rejected the null hypothesis. The combination of gender and health education is a strong predictor of nonadherence to medications among Latinos with diabetes Type II, rejecting the null hypothesis.

Summary

I found that gender is the only strong predictor of nonadherence to medications for Latinos with diabetes Type II. Out of the patients who were randomly selected, the majority of them were women, which could pose as a limitation to the study. However, a higher percentage of women adhered to medications as compared to the percentage of men who adhered. Further investigation would have to be done as to why women are more likely to adhere than men. The combination age, gender and gender, health education proved to be strong predictors to nonadherence to medications for Latinos with diabetes Type II. Chapter 5 includes the interpretation of the findings, limitations of the study, and recommendations.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of the research study was to explore the association between the dependent variable adherence to medications among Latinos with diabetes Type II and the sociodemographics independent variables age, gender, income, migrant worker status, family size, and health education to determine if there are predictors of nonadherence to diabetes Type II medications among Latinos with diabetes Type II. I analyzed the data from 200 males and females patients 18 years of age and older diagnosed with diabetes Type II from a clinic linked to i2i Media tracks that serves eight clinics from rural, suburban, and urban impoverished areas of the city. The research was guided using the SDT and the social cognitive theory. The independent variable showed that health education and gender each showed an association with medication nonadherence among Latinos with diabetes Type II compared to the other variables when a *p* value threshold of .05 was employed; however, after applying the Bonferroni adjustment value, they proved to be significant only when studied in combination.

Interpretation of the Findings

RQ1**:** Are there predictors of nonadherence to medications among Latinos with diabetes Type II?

Finding 1: Age and Nonadherence

I found that there was no association between age and nonadherence to medications among Latinos with diabetes Type II. The adherence rates were 46.5% among Latinos with diabetes Type II with a nonadherence rate of 53.5%. For the age group 18 to 30 years, 85.7% of patients did not adhere and 14.3% adhered to medications

(*n* = 7; 3.5%). For the age group 31 to 45 years, 53.9% showed nonadherence to diabetes Type II medications and 47.1% adhered to medications (*n* = 51; 25%). Patients between the ages of 46 to 60 had an adherence rate of 50% and a nonadherence rate of 50% to medications (*n* = 92; 25.5%). Patients 60 years of age and older showed an adherence of 44% and a nonadherence rate of 56% to medications (*n* = 50; 25.0%). The average age of individuals with diabetes type II among Latinos was calculated at 54.7 years of age. The statistical analysis for the combined test model showed that there is not a significant association between age and nonadherence to medications among Latinos with diabetes Type II. The overall Omnibus Test of Model Coefficients yielded an overall (chi-square = 0.279; *p* = .598; *OR* = .911). The overall Omnibus Test of Model Coefficient Odds Ratio was .911 and the *p* value was .598. Therefore, there was no association between age and nonadherence to medications among Latinos with diabetes Type II. Nozaki et al. (2009) found that there was an association between age and medication adherence. However, Nozaki et al. did not include a percentage distribution of age groups, making it difficult to compare the statistical findings per age group. Among the age groups, there was a correlation between age and nonadherence to medications. The *p* value was greater than 0.05 and the odds ratio was .911, which indicates that there was no association to the outcome adherence.

Finding 2: Gender and Nonadherence

There was a weak to moderate association between gender and nonadherence to medications among Latinos with diabetes Type II. The overall omnibus test of Model Coefficients for gender yielded a (chi-square = 7.734; *p* = 0.005; *OR* = 0.413). Males

showed an adherence rate of 31.7% and a nonadherence rate of 68.3% (*n* = 60; 30%). I found that the male gender nonadherence was high. The adherence rate for females was 52.9% to medications among Latino females with diabetes Type II and a nonadherence rate of 47.1% (*n* = 140; 70%). The results of the study indicate that there is an association to the outcome variable of adherence and a weak association between gender and nonadherence between medications among the Latino female group. The study resulted in 70% of participants being female and 30% males. This mirrors the distribution of gender for patients studied by Mann et al. (2009) who reported that 68% of patients in the study were female. Mann et al. was also not able to conclude a strong correlation between gender and medication nonadherence among Latinos with diabetes Type II. White et al. (2011) used the Spearman correlation coefficient (*p*) values to test bivariate associations between DNT-15 Latino and sociodemographics, gender, nationality, language, education level, and health history regarding diabetes Type II, including insulin. The DNT-15 Latino tool measurement was significantly associated with females generally being more likely to seek out medical care than males. Giving these findings, it may be worth investigating ways to encourage males to seek medical attention through national campaigns or public announcements. It is important to find alternative means to motivate the male Latino patient with diabetes to improve adherence to medications, diet, and exercise. Rustveld et al. (2009) found that self-esteem and a sense of powerlessness can affect Latino American men with diabetes Type II.

Finding 3: Income and Nonadherence

I found that there was not a significant association between income and nonadherence to medications among Latinos with diabetes Type II. The overall Omnibus Test of Model Coefficients for income yielded a (chi-square = 0.001; p = .982; *OR* = 1.003). The overall adherence rate was 46.5% and medication nonadherence 53.5%. The average income was calculated at $10,225. Categories were chosen starting at $1 to $10,000 and incrementing $5,000 per category to represent the 2012 Federal Poverty Measurements of the impoverished areas in Fresno County. The first category $1 to $10, 000 showed adherence of 47.7% and nonadherence of 52.3% (n = 86; 43%). The second category $10,000 to $15,000 showed a medication adherence of 42.1 % and a nonadherence of 57.9% (n = 57; 28.5%). The third category $15,000 to $20,000 showed a statistical analysis of medication adherence of 57.9% and medication nonadherence of 42.1% (n = 19; 9.5%). The fourth category included $20,000 and over and showed statistical analysis for medication adherence of 44.7% and nonadherence of 55.3% (n = 38; 19%). Income and nonadherence p value .982 and the *OR* value 1.003 indicate that there is not an association to income and nonadherence to medication among Latinos with diabetes Type II. The *OR* is closer to 1, however, the p value is greater than 0.05. The *OR* results of 1.003 indicate that there is a weak association to the outcome adherence. Hence, the research findings are similar to the research study conducted by Mann et al. (2009) who reported the predictor income and found it to be inconsistent due to variations in study designs and sample populations. Mann et al. reported that 89% of participants had an income level of less than $30,000. Mainous et al. (2008) found that

Latinos with diabetes Type II with less acculturation showed an annual income of less than $20,000 and were less likely to have completed high school. The studies are similar to the income distribution in this study where 81% of participants had an income level less than $20,000. Thus, this finding correlates to what Mann et al. and Mainous et al. had previously demonstrated. The study population consisted of individuals from impoverished areas of Fresno County who traveled to different areas of the state and to other states looking for employment as migrant farm workers. Many of these individuals have a difficult time meeting their daily health care and medication responsibilities.

Finding 4: Migrant Worker Status and Nonadherence

There was not a significant association between migrant worker status and nonadherence to medications among Latinos with diabetes Type II. The overall Omnibus Test of Model coefficients yielded a (chi-square = .001; p = .982; OR = 1.008). Migrant worker status statistical analysis showed an adherence of 46.5% and nonadherence of 53.5% (n = 159; 79.5%). Migrant worker status did not show a statistical significance to medication nonadherence. This finding is surprising because migrant workers travel from state to state for extended periods of time within the year, making it difficult to get their medications when out of the residency state. I have observed that some migrant workers will plan ahead to ensure that they have sufficient medications while they are away, requesting a 90-day supply of medication. However, they might run out of medication if their assignment is for more than 6 months, or they might still forget to take their medications while they are away. Migrant worker status was not identified in the

literature. Therefore, further research is needed to explore motivational means of increasing adherence among Latino male migrant workers with diabetes Type II.

Finding 5: Family Size and Nonadherence

There was not a significant association between family size and nonadherence to medications among Latinos with diabetes Type II. The overall Omnibus Tests of Model Coefficients rate for family size yielded a (chi-square = .952; p = .329; OR = .869). The overall logistic regression results for family size was medication adherence 46.5% and medication nonadherence was 53.5%. A family size of one had a medication adherence of 42% and a medication nonadherence of 58% (n = 69; 34.5%). A family size of two to four had a medication adherence of 47.8% and a medication nonadherence of 52.2% (n = 92; 46%). A family size of five or more had a medication adherence of 51.3% and a medication nonadherence of 48.7% (n = 39; 19.5%). The family size and nonadherence p value was .329 and the odds ratio was .869. The values indicate that there was no association to the outcome adherence. There has been no previous study on the correlation of family size to medication nonadherence among Latinos with diabetes Type II. Based on the results of this study, family size may be included as a predictor variable in future research studies.

Finding 6: Health Education and Nonadherence

Health education had a statistical association to nonadherence to medications among Latinos with diabetes Type II prior to applying the Bonferroni adjustment. When using the alpha value .05, the results showed a p value of .034 with an odds ratio of 1.9, which may indicate that there is a strong association. The Omnibus Tests of Model of

coefficients was (chi-square = 4.510; p = .034; OR = 1.900). Patients who had health education classes had an overall adherence rate of 51.9% and a nonadherence of 48.1% (n = 131; 65.5%). Out of the 200 patients, 69 did not attend the educational classes and 131 patient attended health educational classes. Patients who take education classes are probably more likely to adhere to medications. Mann et al. (2009) reported that health education from the participants' point of view was not given in a way they could understand or comprehend what was being taught. Because this might have been the case in this study, it may be worth the effort to alter the ways health education is provided to patients with language barriers, limited education, limited knowledge of diabetes Type II, and limited resources including transportation and health care insurance so that more patients can have access to health education. Patients should also be encouraged to bring family members to the health educational classes in order to remind them or aid in their understanding of what has been taught. Health education awareness is important in patients self-managing diabetes Type II, which includes blood glucose testing, understanding of how to take by mouth medications or inject insulin, knowing critical blood glucose levels results, and sticking their finger to find blood glucose level before and after a meal. The WHO (2003) noted that health education is not only for patients but clinicians as well to be able to deliver similar protocols where both the clinician and the patient are ready for adherence supported by a health delivery system.

Finding 7: Age, Gender, and Nonadherence

The combination of age and gender were strong predictors to medication nonadherence among Latinos with diabetes Type II using the alpha p value of .05. The

Logistic Regression Omnibus Tests of Model Coefficients statistic analysis yielded an overall (chi-square = 7.798; p = 0.020; OR = 0.955/0.417). Nozaki et al. (2009) reported that more logistic regression analysis studies are needed in the future using sociodemographics, age, and gender. The results of this finding may corroborate the study findings of Nozaki et al. Age and gender are predictors to medication nonadherence using the alpha value of 0.05. The information can assist researchers in deciding the importance of the predictor variables of sociodemographics, age, and gender for future studies.

Finding 8: Income, Migrant Worker Status, and Nonadherence

The combination of income and migrant worker status was not a strong predictor of medication nonadherence among Latinos with diabetes Type II. The Logistic Regression Omnibus Test of Model Coefficients was (Chi-square = .001; p = .999; OR = 1.003/1.009). Based on my experience of working with diabetic patients, I expected that patients' nonadherence to medications would be related to income and migrant worker status. However, the study findings showed that the combination of income and migrant worker status was not a strong predictor to medication nonadherence. Future studies are needed using the combination variables income and migrant worker status. There are many other factors that limit income and migrant worker status in maintaining adherence to diabetes Type II medications, such as time away from home, values and beliefs about nutrition while working, and exposure to health education.

Finding 9: Age, Health Education, and Nonadherence

The combination of age and health education was not a strong predictor of medication nonadherence among Latinos with diabetes Type II. The Logistic Regression Omnibus Tests of Model Coefficients was calculated an overall (Chi-square = 4.771; *p* = .092; *OR* = .912/1.898). There have been no previous studies done that combined variables similar to this study to identify strong predictors to medication nonadherence among Latinos with diabetes Type II. Therefore, the results of this study may be used for future research using the combination variables as used in this study.

Finding 10: Income, Family Size, and Nonadherence

There was no association between the combination of income, family size, and adherence to medications. The combination of income and family size was not a strong predictor of nonadherence to medications among Latinos with diabetes Type II. The overall Logistic Regression Omnibus Tests of Model Coefficients yielded a (chi-square = 1.172; *p* = .323; *OR* = .937/1.265). Because the combination variable income and family size have not been studied, future research is needed to determine whether family size combined with income is a predictor to medication nonadherence among Latinos with diabetes Type II.

Finding 11: Gender, Health Education, and Nonadherence

The combination of gender and health education was a strong predictor of nonadherence to medications among Latinos with diabetes Type II. Because gender and health education were strong predictors when they were analyzed individually, it is not surprising to see gender and health education combined to be a strong predictor of

medication nonadherence among Latinos with diabetes Type II. The overall Logistic Regression Omnibus Test of Model Coefficients calculated (chi-square = 11.809; p = .003; OR = .420/1.862). Health education should be instructed in a way that meets the needs of the individual patient, taking into account the patient's workplace, work away from home, and nutrition while away from home including drinks. Health educators play an important role as part of the health care team. Health education should be altered, teaching about glucose levels before and after nutrition. Patients should be empowered to perform finger sticks at home before and after meals to prevent hypoglycemia and hyperglycemia reactions in blood glucose levels. It is worth altering health education to make it more appealing for males, while keeping it appealing for females. It is important to teach patients how to maintain hydration without the use of alcohol beverages and diet using the recommended diet by the American Diabetes Association and the Centers for Disease Control and Prevention.

The data analysis included a descriptive and inferential statistical analysis of the association between the independent variables of age, gender, income, migrant worker status, family size, health education, and the outcome of medication adherence. I found that 93 patients (46.5%) were adherent to medications among Latinos with diabetes Type II, and 107 patients (53.5%) were nonadherent to medications among Latinos with diabetes Type II. Nonadherence is defined as a prescription or recommendation from a clinician not followed by a patient. My findings contradict Parada et al. (2012) who demonstrated that, out of 302 patients, 60% of Latinos with diabetes Type II were nonadherent to medications. Wabe et al. (2011) indicated that the worldwide adherence

rate of diabetes Type II medications was approximately 36% to 93%, depending on the demographics and socioeconomic status of the individual. In Fresno County, the nonadherence rate was 53.5% for this study, and thus 46.5% of patients who adhered, demonstrating a lower adherence rate to medications among Latinos with diabetes Type II. Only a few sociodemographics predictors proved to have a strong association to medication nonadherence among Latinos with diabetes Type II.

Limitations of the Study

One of the original limitations of this study was that some patients may not have identified themselves as being Latino; as a result, potential participants may not have been included in the study. It was assumed that most Latino subjects did identify themselves as Latinos. As the data were gathered, there was no way to determine whether or not patients had identified themselves incorrectly; thus, I could not determine whether it truly affected the result of this study.

The study participants were randomly chosen using a random number generator from the archived data base. More women than men were selected. Because gender proved to be a strong predictor of medication nonadherence among Latinos with diabetes Type II, selection bias could have been present secondary to limited access to data.

Recommendations

The study results indicated that only gender and health education are strong predictors to the outcome dependent variable of adherence. Therefore, further study is needed to identify additional variables as possible predictors. It is the responsibility of clinicians to teach personalized health education classes. However, it is also the

responsibility of the patient to attend health education classes. Hospitals, clinics, as well as independent physicians or health educators must follow a protocol of teaching patients about diet, alcoholic beverages, exercise, medications, and the effects these have on diabetes prevention and management. Health education may assist in increasing awareness of self-management.

Because more females than males were randomly selected for the study, I recommend that females and males ought to be studied as separate entities. Additional recommended variables may pertain specifically to diet, for example, number of alcoholic beverages per week, the number of sodas per week, carbohydrate intake, and sugary treats.

Diabetes Type II is without symptoms with the exception of hyperglycemia causing polyuria, polyphagia, and polydypsia. Therefore, the health care team must encourage daily glucose testing to allow the patient to know his/her daily glucose level and understand the need for medication, diet, and exercise. A proactive approach will decrease cultural beliefs relating to causes of diabetes Type II, strengthening the value of diabetes Type II self-management. These opportunities will improve adherence to medication, promote open communication with the patient's primary medical provider, increase adequate diet and exercise, and maintain regular appointments with a medical provider.

Implications to Social Change

Swan (2010) explained that helping patients understand their barriers to diabetes management is important in preventing the same barriers. Understanding why patients are

not able to self-manage their diabetes is important for the patient, the family, and the health care provider. Decreasing cost and complications and improving quality of life and patient satisfaction for both males and females is important to stockholders that finance health care for the uninsured, insurance payers, and the country, including patients and families. Disease awareness and adherences to medications with diabetes Type II among Latinos will decrease complications such as retinopathy, peripheral neuropathy, kidney disease, coronary artery disease, and depression. Adherence to medications prevents premature deaths, preserves body image, improves well being, and increases family, patient social satisfaction. Adherence to medications improves the patients psychological well being and it empowers the patient to self-mange his/her diabetes type II a chronic disease.

The findings of this study could assist in changing or improving national policies in relation to self-management of Latinos with diabetes Type II. Health education, reading materials, or videos should be provided in areas such as waiting rooms. Incentives such as t-shirts or coupons may be offered to patients as a way to bring them into health education classes. Physicians should be persuaded to offer summarized recommendations or to push for patients to take more health education classes. Funds may be considered through grants in order to promote diabetes Type II health education awareness through the media on a regular basis or in the weekly newspaper.

Conclusion

I found that only 46.5% of Latino patients receiving treatment in the community clinic in Fresno County California adhered to medications (chi-square = 7.734; p = .005).

It is important to reach out to physicians, nurses, health educators, nutritionists, and other health care providers across the country with significant predictors of diabetes Type II medication nonadherence to prevent complications and to start early intervention because they are gateways to their communities. Physicians play a key role in promoting diabetes Type II awareness and health education referrals because patients have closer relationships with their physicians. Thus, patients are more likely to adhere to recommendations given by their physicians rather than from other sources. Family members of patients with diabetes Type II also need to be made aware of the implications of diabetes Type II so that they may reach out and suggest lifestyle modifications, diet, and exercise. Patient awareness can be increased through accountability to others while at the same time learning to self-manage diabetes Type II.

Migrant worker status requires goal settings for both the health care provider and the patient to self-manage his or her diabetes Type II when on the road. Patients need to be educated about the self- management of his or her medication by mouth and how to inject insulin. Learning how to prevent hypoglycemia reactions when working on the field or when on the road is an important step in patients taking responsibility for their diabetes Type II management. Blood glucose testing is important and knowing how to interpret and respond to the blood glucose findings. It is important to get the family involved in the self-care of the patient, including diet and exercise

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Appendix A: Letter of Permission

DATA USE AGREEMENT

This Data Use Agreement, effective as of 1/30/2014, is entered into by and between Bianca Tristan and Kevin Hamilton. The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in research in accord with the HIPAA Regulations.

1. Definitions. Unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the "HIPAA Regulations" codified at Title 45 parts 160 through 164 of the United States Code of Federal Regulations, as amended from time to time.

2. Preparation of the LDS. Kevin Hamilton shall prepare and furnish to Data Recipient a LDS in accord with HIPAA Regulations

3. Data Fields in the LDS. No direct identifiers such as names may be included in the Limited Data Set (LDS). In preparing the LDS, Kevin Hamilton shall include the **data fields specified as follows**, which are the minimum necessary to accomplish the research: Age, gender, income, migrant worker status, and health education.

4. Responsibilities of Data Recipient. Data Recipient agrees to:

    a. Use or disclose the LDS only as permitted by this Agreement or as required by law;

    b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;

    c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;

    d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and

    e. Not use the information in the LDS to identify or contact the individuals who are data subjects.

5. Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS for its research activities only.

6. Term and Termination.

   a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.

   b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.

   c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.

   d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

   e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.

7. Miscellaneous.

   a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.

   b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.

   c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.

   d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

DATA PROVIDER

Signed: Kevin D. Hamilton

Print Name: Kevin D. Hamilton, RRT,RCP

Print Title: Deputy Chief of Programs

DATA RECIPIENT

Signed:

Print Name: Bianca L Tristan

Print Title: Student

Appendix B: National Institute of Health Certificate of Completion

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research Certifies **Bianca Tristan** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of Completion: 09/24/2011

Certification Number: 761208

Appendix C: Curriculum Vitae

BIANCA L. TRISTAN—RN, CCRN, FNP, MSN

SKILLS/DUTIES

- Responsible for patient management, including physical diagnosis and psycho-social assessment in primary health care.
- Skilled in triage, lacerations and assisting the ER physicians with critical care conditions.
- Specialized in women's health, provided care prenatal, family planning, and GYN preventive.
- Have written and instituted protocols for Phase I Cardiac Rehabilitation
- Provided leadership for a 43-bed telemetry unit
- Responsible for annual budget
- Implemented JCHO guidelines and 24-hour unit accountability
- Provided care for critically ill patients, which included hemodynamic monitoring, ICP monitoring, PCA pumps, vasoactive drugs, vascular condition, ventilation, and assessment.
- Monitored acute seizure disorders, head trauma, and dilantin research for patients with head trauma.
- Provided telemetry nursing. Responsible for supervising and scheduling 25 professionals and directing shift unit operations and functions.
- Provided patient care, including monitoring fluid and electrolyte imbalances, physical assessments and interventions.

PROFESSIONAL EXPERIENCE

2008 to Present	**Clinica Sierra Vista**	*Family Nurse Practitioner*
2004 to 2008	**Sequoia Community Health Center**	*Family Nurse Practitioner*
2002 to 2004	**Good Sam Hospital**	*Family Nurse Practitioner (ER)*
2002 to 2004	**San Judas Medical Center**	*Family Nurse Practitioner*
2001 to 2002	**LAC/USC County Hospital**	*Family Nurse Practitioner*
1998 to 2001	**Community Health Foundation**	*Family Nurse Practitioner*

1996 to 2003	**Robert F. Kennedy Hospital**	*CHW Administrative Supervisor*
1993 to 1997	**Charter Community Hospital**	*Cardiac Nurse Rehabilitation Coordinator*
1991 to 1997	**Charter Community Hospital**	*Nurse Manager Definitive Observation Unit; Nursing Supervisor*
1987 to 1989	**White Memorial Medical Center**	*Staff Nurse—Intensive Care*
1987 to 1988	**Kings Drew Medical University**	*Double-Blinded Research Nurse*
1983 to 1987	**White Memorial Medical Center**	*Charge Nurse—Definitive Observation Unit*
1981 to 1983	**White Memorial Medical Center**	*Staff Nurse—Medical/Surgical Orthopedic; Pediatrics*

EDUCATION

Presently	**Walden University** *PhD—Public Health, Epidemiology*
1997 to 1998	**CA State University, Dominguez Hills** *Post-Master's Degree—Family Nurse Practitioner*
1994 to 1996	**University of Phoenix** *Master's Degree—Nursing Administration*
1987 to 1988	**Pacific Union College** *Bachelor's Degree—Nursing, PHN Certificate*
1982 to 1985	**Compton Community College** *Associate's Degree—Nursing*
1978 to 1980	**Compton Community College** *Licensed Vocational Nurse*

LICENSURE/CREDENTIALS

- ANCC Certified
- Family Nurse Practitioner
- CA Registered Nurse'
- American Heart Association Advanced Cardiac Life Support Certified
- American Red Cross Disaster Health Nurse
- State of CA Certified Public Health Nurse

PROFESSIONAL ORGANIZATIONS

- American Academy of Nurse Practitioners; active member since 2000
- American Nurses Association; active member since 1998
- American Association of Critical Care Nurses; active member
- since 1986

OTHER DATA

- Verbal and written fluency in Spanish
- References available upon request