Spring 5-2022

Quality of Life in Persons with Type 2 Diabetes Mellitus Who Also Have Depression as Defined by the Beck Depression Inventory

Lauren Rosenston

QUALITY-OF-LIFE IN PERSONS WITH TYPE 2 DIABETES MELLITUS WHO ALSO HAVE DEPRESSION AS DEFINED BY THE BECK DEPRESSION INVENTORY

by

Lauren Rosenston, B.S., RD, LD

A Thesis Presented in Partial Fulfillment
of the Requirement for the Degree Master of
Science

COLLEGE OF APPLIED AND NATURAL SCIENCES
LOUISIANA TECH UNIVERSITY

May 2022

LOUISIANA TECH UNIVERSITY

GRADUATE SCHOOL

February 11, 2022
Date of thesis defense

We hereby recommend that the thesis prepared by

Lauren Rosenston

entitled   **Quality of Life in Persons with Type 2 Diabetes Mellitus Who Also**

Have Depression as Defined by the Beck Depression Inventory

be accepted in partial fulfillment of the requirements for the degree of

Master of Science in Nutrition & Dietetics

Vicky L Green
Dr. Vicky Green
Supervisor of Thesis Research

Ethel N. Jones
Dr. Ethel Jones
Head of Human Ecology

Thesis Committee Members:
Dr. Simone Camel
Dr. Catherine Fontenot

Approved:

Gary A. Kennedy
Dean of Applied & Natural Sciences

Approved:

Ramu Ramachandran
Dean of the Graduate School

ABSTRACT

Registered Dietitian Nutritionists (RDN) are an essential part of type 2 diabetes disease management. This study assessed whether self-reported symptoms of depression, glycemic control, and reported intervention by a RDN had an impact on the quality-of-life in person diagnosed with type 2 diabetes mellitus. An online survey was created using Qualtics software which was distributed to a convenience sample of online support groups for people diagnosed with diabetes as well as the personal pages of the researchers. The survey was available for 10 weeks and collected demographic data, information regarding the RDN intervention and assessed participant diabetes related quality-of-life using the Appraisal of Diabetes Scale and depressive symptoms using the Beck Depression Inventory-II. A total of 95 participants' responses were used for data analysis. Frequencies and measures of central tendency were used to describe the demographic data. A positive correlation was found between the Beck Depression Inventory-II scores and Appraisal of Diabetes Scale scores (quality-of-life) ($p<.01$). There was significant difference found in mean Appraisal of Diabetes Scale scores for those having glucose monitoring checks outside of the recommended range greater $\geq 50\%$ of the time when compared to those outside of the range for $\leq 25\%$ of the time ($p=.001$). The results suggest that RDN's who can help achieve glucose control can also improve a person's diabetes related quality-of-life and decrease depressive symptoms. Further research is needed to validate these results.

APPROVAL FOR SCHOLARLY DISSEMINATION

The author grants to the Prescott Memorial Library of Louisiana Tech University the right to reproduce, by appropriate methods, upon request, any or all portions of this Thesis. It is understood that "proper request" consists of the agreement, on the part of the requesting party, that said reproduction is for his personal use and that subsequent reproduction will not occur without written approval of the author of this Thesis. Further, any portions of the Thesis used in books, papers, and other works must be appropriately referenced to this Thesis.

Finally, the author of this Thesis reserves the right to publish freely, in the literature, at any time, any or all portions of this Thesis.

Author _____

Date _____

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

CHAPTER 1

INTRODUCTION

Type 2 diabetes mellitus is a chronic disease that affects millions of people worldwide (Mansori et al., 2019). A diagnosis of type 2 diabetes is often associated with several comorbidities and health concerns (Stone, 2020). Depending on the progression of the disease and the presence of comorbidities, treatment options will vary. One component of diabetes treatment is Medical Nutrition Therapy (MNT). MNT has been defined as nutrition-based treatment provided by a Registered Dietitian Nutritionist (RDN). It includes nutrition diagnosis, therapeutic and counseling services to help manage diabetes (Early & Stanley, 2018). Nutrition therapy is a major component of treatment and relies heavily on self-adherence. The key to the effectiveness of the RDN and the strategies recommended to the patient for managing their condition is accurate and truthful information regarding the patient's barriers and limitations to complying with their diet and medication regimens and self-care routines (Early & Stanley, 2018).

Several factors have been identified as contributing to patients with diabetes non-compliance and non-adherence to their prescribed nutrition plan. A formal diagnosis of depression is made in 10-15% of people with diabetes and presents a challenge in disease management as outcomes of both conditions are seen to be worsened in the presence of the other (Holt, et al., 2014). Depression is defined as a common but serious mood

1

disorder causing severe symptoms affecting how a person feels, thinks, and handles daily activities (Depression, 2018). In order to be diagnosed with depression symptoms must persist for at least two weeks (Depression, 2018). Research indicates that depression may be overlooked by clinicians when exploring possible causes of non-compliance among those with diabetes (Gois et al., 2018). Depression can impair self-care behaviors and practices and negate a person's overall motivation to take care of their health (Shretha et al., 2019). A person's inability to adequately care for themselves may make managing their diabetes difficult and therefore worsen their overall health condition.

<div align="center">Statement of the Problem</div>

Diabetes Mellitus affects about 425 million people worldwide and researchers predict the number of people with this chronic condition will continue to rise (Shrestha, et al., 2019). In the United States, there are 23 million people with a diabetes diagnosis. Of those 23 million, 1.3 million have been diagnosed with type 1 diabetes and 21 million with type 2 diabetes (Bullard et al., 2016) Depression is the leading cause of disability affecting about 300 million people worldwide; and depression often accompanies those with type 2 diabetes because individual's with type 2 diabetes are twice as likely to also suffer from depression (Shrestha et al., 2019). Depression can lessen the impact of nutrition interventions and therefore lessen the effectiveness of this treatment method for managing the disease. Research has documented that when depression is treated in those with diabetes there is a clinical improvement in mood, diet adherence, and overall treatment success Zurita-Cruz et al., 2018). Unfortunately, half of those with type 2 diabetes are not assessed for signs and symptoms of depression (Gois et al., 2018).

Medical Nutrition Therapy is an important component for the effective treatment and management of type 2 diabetes. Research suggests that effectiveness of the strategies taught by the Registered Dietitians could be enhanced by including depression assessment criteria when collecting the patient's medical history.

Purpose

The purpose of this study was to assess whether self-reported symptoms of depression, glycemic control, and report of an intervention by a Registered Dietitian Nutritionist had an impact on the quality-of-life in persons diagnosed with type 2 diabetes mellitus.

Hypotheses

1. There will be no significant difference in quality-of-life scores between persons with type 2 diabetes who have ever been educated by a Registered Dietitian Nutritionist and those who have not.

2. There will be no significant difference in quality-of-life scores between persons with type 2 diabetes who were educated by a Registered Dietitian Nutritionist within a year of their diagnosis and those who were not.

3. There will be no significant correlation between quality-of-life scores and self-reported frequency of blood glucose serum levels outside of a person's recommended range.

4. Depressive symptoms scores will not predict quality-of-life scores in persons with type 2 diabetes.

<u>Justification</u>

Type 2 Diabetes Mellitus is a chronic disease that affects 12.2% of Americans and costs the United States healthcare system an estimated $245 billion to treat (Early & Stanley, 2018). Registered Dietitians have the skill set to effectively counsel those with type 2 diabetes but should be aware of underlying signs and symptoms of depression to enhance treatment outcomes. The Beck Depression Inventory survey short form has been successful in clinical settings to identify those with depression among those with diabetes. The ability to determine whether a patient with type 2 diabetes is also being affected by depressive symptoms can better equip clinicians in developing individualized nutrition strategies. The information from this project related specifically to quality-of-life scores in those with type 2 diabetes and how depression may potentially impact those scores can give clinicians a better understanding of how the diseases may affect the person overall.

CHAPTER 2

REVIEW OF LITERATURE

Type 2 Diabetes Mellitus

Diabetes mellitus is one of the most common chronic diseases worldwide (Khan et al., 2019). Diabetes is characterized by hyperglycemia with changes in the metabolism of carbohydrates, proteins, and fats. The global prevalence, specifically of type 2 diabetes, has nearly doubled in the adult population over the past two decades. The number of persons diagnosed with diabetes is expected to exceed 336 million by the year 2030 (Mansori et al., 2019).

Patients with type 2 diabetes account for about 90% of all people living with diabetes (Jing et al., 2018). It has been found that 1 in 3 adults, 65 years or older, living within the United States has diabetes. Diabetes accounts for approximately 12.2% of the US general population with 33.9% of the population being considered at very high risk for developing pre-diabetes with an increased risk of being diagnosed with type 2 diabetes (Early & Stanley, 2018).

Diabetes also poses a risk for both short and long-term complications. Short term complications include hypo and hyperglycemia and long-term complications include kidney failure, stroke, blindness and possibly amputation due to neuropathy. All of these associated complications can significantly impair physical activity, quality-of-life and work efficacy (Mansoi et al., 2019).

When diabetes is ill-managed or left untreated, comorbidities and complications can develop. One complication associated with poorly managed diabetes are referred to as micro vascular side effects. Micro vascular complications include neuropathy, retinopathy, nephropathy and diabetic foot syndrome. Another complication associated with poorly managed diabetes is referred to as macro vascular complications. Macro vascular complications include systemic hypertension, acute myocardial infarction, chronic heart failure, cerebral vascular accident and peripheral artery disease (Zurita-Cruz et al., 2018). Diabetes and its associated complications put an added financial burden on the healthcare system. In 2012, the estimated cost of diagnosed diabetes in the US was $245 billion. This was a 41% increase from 2007 (Early & Stanley, 2018).

Depression has been found to increase the risk for both micro and macro vascular complications in type 2 diabetes as well as increasing the risk for hyperglycemia (SV et al., 2016). There are also emotional disturbances that people diagnosed with diabetes must appropriately manage. Roy et al. 2018 found that patients with diabetes have a variety of emotional reactions including shame, fear, shock and guilt. Emotional distress was credited to be more related to diabetes than any other comorbidity a person may be managing (Roy et al., 2018).

<div align="center">Depression and Diabetes</div>

According to the World Health Organization, the global leading cause of disability is depression. There are about 300 million people worldwide living with this mental disorder (Khan et al., 2019). Depression is also the most common psychiatric disorder seen in patients with diabetes (Mansori et al., 2019). Depression affects 10-30% of adults diagnosed with diabetes and the prevalence of depression in those with type 2

diabetes is about twice as common compared to the general public (Shrestha, et al., 2019). There is also evidence showing that the prevalence of depression is moderately increased in patients who are pre-diabetic as well as those persons with undiagnosed diabetes (SV et al., 2016).

Depression among people with diabetes at any level has been shown to increase their risk of developing metabolic syndrome when compared to those without depression. Specifically, women with depressive symptoms have been observed to have greater waist circumference, fasting blood sugar, blood pressure and lower than recommended HDL levels (Gois et al., 2018). The study conducted by Gois et al. found that treating depressive symptoms particularly in middle-aged women, improved hyperglycemic control and reduced metabolic deterioration. Kian et al. notes that mental stress can lead to glycemic deregulation. Diabetes may have a significantly negative effect on a person's mind and social function as well as their physical abilities (Kian et al., 2018).

It is estimated that people with type 2 diabetes within a five-year period will experience at least one episode of sub-threshold depression, a less severe form of depression that does not meet the diagnostic threshold for a major depressive mood disorder (Shrestha et al., 2019). Data from NHANES 2005-2012 was the first to provide a United States national level estimate of depression prevalence in those with type 2 diabetes mellitus. Depression was categorized as clinically relevant or clinically significant based upon Patient Health Questionnaire (PHQ-9) scores. Prevalence of clinically relevant depression in those with type 2 diabetes was estimated at 10.6%, about 1.56 times the average of the general population. Clinically significant depression in

those with type 2 diabetes was 4.2%, 1.75 times higher than the general US population (Wang et al. 2016).

Depression also has high rates of relapse and low rates of remission making it a condition that is unlikely to ever be completely resolved (Opie et al., 2017). It has been suggested that half of people diagnosed with type 2 diabetes have not been accurately diagnosed or assessed for depressive symptoms. This suggests that the prevalence of depression and diabetes may be more common than initially thought (Gois et al., 2018).

According to Martino et al. (2020), depression could potentially impact a person's ability to deal with the emotional stress associated with chronic disease management. The psychological factors that may affect a patient's compliance and adherence to medical management for that chronic disease could lead to increased mortality and morbidity. Factors such as body mass index (BMI), smoking and alcohol consumption could be possible predictors of depression in those with type 2 diabetes. It has been acknowledged that feelings of loss, guilt and anger are associated with worsening glycemic control and are indicators of poor medical adherence (Martino et al, 2020). Zurita-Cruz et al. (2018),notes that depression and diabetes interact so closely with one another that it is difficult to identify which pathology begins first and causes the latter. Depression can increase the risk of diabetes related complications in people with diabetes due to poor self-care, reduced treatment adherence, and poor glycemic control (Wang et al. 2016).

Gender can also have an impact on the presentation of depression. One study found that women have significantly more depressive symptoms and were three times more likely to be taking antidepressants when compared to men. Women were noted to have significantly higher HbA1c values than the men in the study as well. In addition,

subjects presenting with major depressive disorder and a background of low education levels were at a higher risk of developing type 2 diabetes (Gois et al., 2018).

Depression may also increase the risk of the development of type 2 diabetes by 60% (SV et al., 2016). Several studies show that those with depression are at an increased risk of developing diabetes making these two diagnoses more connected than previously thought (Zurita-Cruz et al., 2018; Shrestha et al., 2019). One reason for the increased risk of developing diabetes is because it has been found that continuous antidepressant use is significantly associated with diabetes risk. However, the risk of depression does not increase with all diabetes treatments. Insulin therapy used in elderly patients with type 2 diabetes can lead to the improvement of depressive symptoms and does not affect patient's overall health-related quality-of-life (SV et al., 2016). The Preventative Behavioral Risk Factor Surveillance System found depression prevalence of 24% in people with type 2 diabetes who are using insulin and 17.3% in those not using insulin (Wang et al. 2016). Another study conducted on 250 adult patients with type 2 diabetes found that those on insulin therapy showed more depressive symptoms than those on an oral glucose controlling medication (Roy et al., 2018). The differences found in these studies suggest that the impact of insulin therapy on depressive symptoms is unpredictable because of population diversity. Zurita-Cruz et al. (2018), states that type 2 diabetes can lead to a loss of health which can in turn lead to depression but also depression can lead to unhealthy behaviors, such as poor eating, which can lead to the onset of type 2 diabetes.

Complications of diabetes can also have an emotional and physical impact on a person's overall well-being. This can generate feelings of frustration and other symptoms

9

linked to depression (Zurita-Cruz et al., 2018). An association has been made between depression in those people with diabetes and weak self-care behaviors. Those with weak self-care behaviors may incur reduced blood glucose control and overall decline in physical function (Gois et al., 2018). Those on insulin therapy also had higher scores on the Diabetes Distress Scale compared to those on the oral glucose controlling medications. This assessment tool also found patients with severe diabetes-specific related distress also had significant association of evidence with mild depression based on scores using the Beck Depression Inventory. These results support the claim that a comprehensive approach to type 2 diabetes should include an assessment for depression and diabetes specific related distress (Roy et al., 2018).

There was also an association between age and glycemic control. A younger age overall, in a study with 18- to 65-year-old adults, was found to have a stronger association with poor glycemic control in both men and women. Specifically, glycemic control was positively associated with depressive symptoms and negatively associated with comorbidity in women. Women also had a statistically significant association between depressive symptoms and glycemic index after adjusting for age, education level, duration of diabetes diagnosis, chronic complications, comorbidities, and antidepressant use. Men were not found to have the same statistically significant association between depressive symptoms and glycemic index (Gois et al., 2018).

The National Health and Nutrition Examination Survey (NHANES) 2005-2012 survey assessed the prevalence of depression among those with type 2 diabetes. The subject's demographic characteristics were as follows: mostly women (51.3%), ages of 30 years or above, were mostly Non-Hispanic Black, Mexican or other Hispanic or

another race, single and/or living alone, less physically active, lower income, lower education level, presence of sleep problems, cardiovascular complications, cancer and liver diseases. Women with type 2 diabetes were categorized with clinically relevant depression more than men. People with type 2 diabetes who were ages 30-49 were also three-fold as likely to have clinically relevant depression compared to those 65 years or older. Body mass index (BMI) and its significance to depressive symptom risk was also addressed. Those with a BMI greater than 30 or 35, which is categorized as severe obesity, was associated with clinically relevant depression strengthening the need for nutrition intervention and adherence (Wang et al. 2016).

The treatment of depression in participants with diabetes was found to be associated with a significant improvement in the clinical presentation of their diabetes. Improvements in mood and adherence to diet and treatment have been found (Zurita-Cruz et al. 2018). Shrestha et al. found that depression was associated with reduced knowledge of diabetes and poor participation in patient education programs. Compliance with diet, medication, exercise, glucose monitoring, appointment follow through and foot care becomes affected when a person is showing depressive symptoms. There was also a strong association with decreased adherence to dietary recommendations and physical activity in those with depression and type 2 diabetes (Shrestha et al., 2019).

There are both prescription and nonprescription drugs that can be used in the treatment of depression. Antidepressant usage was reported at 85% by those who participated in the NHANES study. It was also noted that antidepressant treatment alone may not achieve remission of depressive symptoms. However, it was also reported that only 1 in 7 people reported talking to a mental health specialist which indicates an

opportunity for improving the overall health and well-being of patients with type 2 diabetes who are also showing signs and symptoms of depression Wang et al. 2016).

Routine screening for depression in adults with diabetes is recommended by the Association of Clinical Endocrinologists. However, not all patients receive this screening (Wang et al. 2016). Mindfulness stress-based reduction programs have been found to help increase the wellbeing and general health while also reducing A1c, anxiety and depression in those with type 2 diabetes. Mindfulness stress-based reduction is a useful method in helping people with type 2 diabetes reduce their emotional stress and improve glycemic control. Mindfulness techniques used by participants has demonstrated improved stress levels, reduced anxiety, and lessened depressive symptoms in those with type 2 diabetes (Kian et al., 2018). In addition, management of comorbid depression and diabetes through collaborative care was shown to improve medication adherence and glycemic control as well as depression outcomes (Wang et al. 2016).

<center>Quality-of-Life and Diabetes</center>

The World Health Organization defines quality-of -life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (Zimmermann et al., 2017). Quality-of-life is a person's individual perception of physical, emotional and social status (Jing et al, 2018) as well as their sense of well-being of physical, psychological, social and spiritual conditions (Zurita-Cruz et al., 2018).

Chronic disease may affect an individual's quality of life because they impair their heart and kidney function and immunity. Depending on the severity of their medical condition and limitations it imposes on their activities of daily living (ADLs), they may

develop signs and symptoms of depression. Research indicates that depression and chronic disease are major factors associated with reduce quality of life (Zimmermann et al., 2017). Other researchers suggest that the mere presence of comorbidities leads to decreased quality-of-life (Zurita-Cruz et al., 2018). Health-related quality-of-life in adults 18-65 years was most negatively impacted by hypertension, depression and diabetes. These three chronic conditions, diabetes, hypertension and depression, were also the most prevalent when compared against heart disease and respiratory diseases (Zimmermann et al., 2017).

Demographics such as gender, age, education, employment and income must also be considered when evaluating a person's quality-of-life. Lower socioeconomic class and unemployment were also associated with lower health-related quality-of-life (Zimmermann et al., 2017). The measure of chronic disease severity (CDS) is sensitive to both demographics and geographic characteristics. (Stone, 2020). CDS in adults 19-64 years old in the United States revealed a strong and significant independent association with perceived health-related quality-of-life. This indicated that CDS might be a predictor of future healthcare expenses and mortality risk. A high prevalence of CDS was significantly greater in adults with less than excellent perceived health-related quality-of-life (Stone, 2020). This could potentially lead to a decline in self-management potentially increasing an individual's risk for developing chronic disease.

Depression is a chronic disease that can affect people of all races, ages, genders and income levels. The prevalence of a major depressive disorder among Caucasians is reported at 17.9% while African Americans are at 10.4%. The difference is that Caucasians report seeking treatment more often than African Americans making African

Americans more likely to have a faster and potentially worse overall disease process (Bailey et al., 2019). The odds of fair or poor health-related quality-of-life among African American adults were 1.23 times higher compared to those in white adults. Men in general also had greater odds of a fair or poor health-related quality-of-life when compared to women. Low federal poverty level was also a strong risk factor for fair or poor health-related quality-of-life (Stone, 2020).

Another factor for fair or poor health-related quality-of-life (HRQOL) was increasing age. Those 55-64 years old had more than double the odds of having lower HRQOL scores than any other age range. Those with medium to low CDS had more than twice the adjusted odds of a fair or poor HRQOL and those with medium or high CDS had more than six-fold greater adjusted odds of fair or poor HRQOL (Stone, 2020). Age was also noted as an independent factor influencing overall quality-of-life. Those with an inadequate quality-of-life score had greater durations of diabetes, more comorbidities, higher prevalence of depression and were older than those with an acceptable quality-of-life score (Zurita-Cruz et al., 2018).

Adults with a disability had over four times the adjusted odds of a fair or poor HRQOL compared to those without a disability. Adults with insurance were significantly more likely to have low CDS and less prevalence of high severity conditions. There is an observed association between CDS and fair or poor HRQOL. The CDS measure was strongly associated with fair or poor HRQOL and the odds of this outcome increased as the severity of conditions increased (Stone, 2020).

Adults with multiple chronic conditions experience a lower perceived health-related quality-of-life which has been determined to be a prediction of mortality. Those

with chronic conditions, such as diabetes, are at an increased risk of mortality with a subsequent reduced quality-of-life (Stone, 2020).

Diabetes is known to be a difficult disease to manage, requiring long-term self-management through blood glucose monitoring, diet, exercise as well as medical treatment (Martino et al., 2020). Individuals with type 2 diabetes experience a heightened sense of pressure to treat their condition which in turn causes a reduced quality-of-life (Jing et al., 2020). However, with successful management of the disease an improved perceived quality-of-life can occur (Martino et al., 2020). Persons with type 2 diabetes who check their glucose levels more frequently are found to have improved quality-of-life compared to those who checked less frequently (Jing et al., 2020).

A person's quality-of-life is greatly impacted with diagnosis of type 2 diabetes. The challenges they face in managing their diabetes, and the impact their diagnosis has on perceived quality-of-life can subsequently lead to an overall reduced quality-of-life (Zurita-Cruz et al., 2018).

<center>Depression and Quality-of-Life</center>

Depression is an independent factor influencing overall quality-of-life and has a significant impact when considering other factors such as age. Depressive symptoms also have a negative effect on quality-of-life. The strongest effect was found to be on physical and emotional health. Depression, which is common among people with type 2 diabetes, is known to be associated with the perception of having a poor quality-of-life (Zurita-Cruz et al., 2018). Sub-clinical depression, a less severe form of depression, is associated with poor self-care behavior and may in turn affect all aspects of diabetes treatment. Less than 1% of people with minimal or no depressive symptoms reported symptoms having a

<center>15</center>

low impact on their daily lives where as those with moderately severe or severe depressive symptoms reported a more negative impact on their daily lives. It was also reported that 55.3% of people with moderate to severe depressive symptoms experienced poor physical and mental health keeping them from doing typical activities like self-care, work, school or recreational activities. Also significant in the NHANES, 23.2% of people with type 2 diabetes with moderate to severe depressive symptoms based on the PHQ-9 survey scores reported it is extremely difficult for them to do their work, take care of their home, or get along with people (Wang et al. 2106). Martino et al. (2020) in Italy, found that when compared to normal samples, study participants with a mild level of depression had worsened perceived quality-of-life in both physical and mental presentation.

For people with an existing diabetes diagnosis, depression can be an added factor that can affect not only glycemic control but their quality-of-life (Zurita-Cruz et al., 2018). According to Khan et al. (2019), depression with comorbidity of type 2 diabetes reduces a person's overall quality-of-life and life expectancy because depression has been found to be directly associated with quality-of-life measure and worsen quality-of-life in those with type 2 diabetes. In addition, disease related complications are heightened because elevated type 2 diabetes disease markers such as HbA1c are elevated (Jing et al., 2020) According to the American Psychological Association 31% of patients with a chronic disease discuss stress management methods with their healthcare provider but only 1% actually put those methods into practice (Kian et al., 2018). This can potentially also be cause for reduced quality-of-life.

Demographics Related to Chronic Disease Risk

Diabetes is a chronic disease and is associated with increasing an individual's mortality and reducing their quality-of-life. A measure of the chronic disease severity is able to provide a relevance of CDS for both use in healthcare and public health. The prevalence of high chronic disease severity (CDS) has been shown to be greater among women than men (Stone, 2020). This puts women at greater risk of incurring complications associated with chronic disease. However, men were found to have more complications from multiple chronic conditions than women (Gois et al., 2018). Adults who did not identify as non-Hispanic white had significantly higher prevalence of high CDS when compared to non-Hispanic white adults. This included adults of Black/African American, Hispanic or Latino ethnic backgrounds. Black/African American adults had a 1.23 times higher rate of health-related quality-of-life when compared to non-Hispanic white adults (Stone, 2020).

The geographic location in which a person resides can also influence their chronic disease risk. Several states have reported a higher-than-average prevalence of CDS. States identified included West Virginia, Kentucky, Massachusetts, Alabama, Arkansas and Tennessee. All states within the East South-Central region of the country had above average numbers of CDS. The majority of southern, New England and East North Central regions had a CDS at or above the national average (Stone, 2020).

When looking at income, states with a lower per capita income had a significantly greater occurrence of medium-high or high level of CDS. States with a higher income per capita had a 65.4% risk of any level of CDS, varying from low to high, compared to states with a lower income per capita showing only a 58.9% risk. When considering age,

the risk of CDS increases greatly once a person reaches an age of 40-60 years old. There was a flattening and stabilization of risk at 60-64 years old (Stone, 2020). In diabetes specifically, younger age overall, in those 36-65, is associated with poorer glycemic control in both men and women (Gois et al., 2018)

Other demographics that revealed an increased risk of chronic disease severity included those with a disability and adults living below the federal poverty level (Stone, 2020). Those with depression and low educational attainment also have a higher risk of chronic disease such as type 2 diabetes (Gois et al., 2018)

<p align="center">Nutrition Intervention and Diabetes</p>

It has been well-documented that nutrition intervention can positively impact the management of diabetes. NHANES III data indicates that additional efforts are needed to improve dietary habits in adults with type 2 diabetes (Lemon et al., 2004). There is strong evidence that medical nutrition therapy (MNT) provided by a Registered Dietitian Nutritionist (RDN) is both effective and essential in the management of diabetes (Franz & MacLeod, 2018). RDN's are uniquely qualified to provide nutrition intervention to meet the varied needs of people managing diabetes (Lemon et al.2004).

The Academy of Nutrition and Dietetics (AND) has established best practices for managing diabetes and minimizing complications. The Academy recommendations includes three to six encounters with a RDN within the first six months of diagnosis, a minimum of one annual follow-up with a RDN, and that the RDN create individualized interventions that take personal preferences into account. AND also recommends the RDN tailor the intervention to the prognosis and comorbidities of the patient. Treatment individualization and patient collaboration enhances the effectiveness of MNT (Franz &

MacLeod, 2018). Early and Stanley's study for the Academy of Nutrition and Dietetics also concludes that MNT delivered by a RDN is both clinically and economically effective for the prevention and management of type 2 diabetes.

Registered Dietitians who provided diabetes education and averaged 56-166 minutes with each patient most commonly discussed relationships with food, medication regimen, benefits of exercise, blood glucose and weight control, label reading, and low-fat diet guidelines. In addition, the RDNs individualized each patient's carbohydrate needs and taught them how to manage their intake by teaching them how to effectively use exchange patterns or carbohydrate counting (Lemon et al., 2004). Lemon et al. found that increased time spent with the RDN as well as increased number of education sessions were associated with improvement in weight loss, body mass index, HbA1c, fasting plasma glucose, total cholesterol and triglyceride levels. An increase in blood glucose self-monitoring frequency as well as improved blood glucose levels also correlated with RDN education sessions (Lemon et al., 2004).

Lemon et al. (2004), showed a three-month decrease in HbA1c values in newly diagnosed subjects as well as those who have had diabetes for an average of four years. The decline found in this study has potential to substantially decrease health care costs associated with microvascular complications. Self-management behaviors were also improved which helped to improve quality-of-life outcomes as well as health behaviors. A slow in disease progression was shown between three and six months suggesting that sustained treatment and additional intervention is needed to support maintaining behavior changes and clinical improvement (Lemon et al., 2004).

Franz & MacLeod (2018) indicated that all MNT interventions for those with type 2 diabetes resulted in a reduced energy intake which resulted in weight loss. Weight reduction is often a primary recommendation for those people with type 2 diabetes. When weight management is needed in combination with diabetes management, the success rate for women in self-monitoring blood glucose levels decreases (Zurita-Cruz et al., 2018). Participants experienced their disease as an unforeseeable setback and were then less likely to reach glycemic goals with insulin treatment (Gois et al., 2018). However, blood glucose control is achieved by a healthy diet with physical activity validating the need for those with type 2 diabetes and depression to be equipped with the tools needed to adequately care for themselves (Lemon et al., 2004).

A large random controlled trial in Europe revealed that those participants with type 2 diabetes assigned to receive a Mediterranean diet supplement as well as mixed nuts had a 41% reduction in the risk of developing depression when compared to the control group. A cross sectional analysis in Australia concluded that women specifically who had intake less than the recommended amount of red meat were more likely to have clinical depression and anxiety disorders when compared to those consuming the recommended amount. Moderate consumption of zinc found in red meat might be the reason why depressive symptoms are lower in red meat eaters because zinc deficiency is commonly observed in clinical depression (Opie et al., 2017).

Early & Stanley found that MNT intervention was most effective if used throughout the entire disease duration. The largest observed decease in HbA1c levels was observed with newly diagnosed persons with diabetes who had a higher-than-average baseline HbA1c level. Weight gain associated with medication use could be prevented

with ongoing MNT support and an improvement in quality-of-life and perception of one's health status. In addition, MNT was a reported to increase patient's knowledge and motivation regarding disease management and influence a reduction in emotional stress. When comparing 21 studies, 18 concluded that MNT intervention was able to successfully lower HbA1c anywhere from 0.3% to 2% in 3 months. MNT beyond 3 months helped to sustain or improve HbA1c levels even further. Control groups were noted to have unchanged or slightly increased HbA1c levels when following their usual care and having no intervention. The use of MNT was also able to reduce the dosages and/or number of glucose-lowering medications used by participants. They also noted the importance of continued MNT encounters for maintenance and continued improvement in HbA1c levels in adults with type 2 diabetes. The study's authors focused on MNT such as eating and physical activity habits, and when compared to control groups found MNT to improve clinical outcomes of participants better than metformin usage. The duration of MNT was also explored within this study. Results found that participants showed improved weight and fasting glucose levels with two to twelve visits with a nutrition professional. It also concluded that lifestyle intervention among those participants with prediabetes over at least a three-month period were able to decrease their fasting blood glucose by 2-9 mg/dL. MNT was found to be statistically significant as well as clinically meaningful for weight loss efforts in adults considered overweight or obese as well as helping to reduce the risk for diabetes and lipid metabolism disorders.

Quality-of-life assessment of the participants in the Lemon et al. study showed improvement in the perception of health status over the course of the study. This left the participants feeling more knowledgeable and motivated after seeing a RDN. Early &

Stanley note the overall improvement in a person's quality-of-life when looking at studies of MNT among adults with diabetes and prediabetes. Nutrition intervention with diet control showed no association with quality-of-life. It was noted that diet control could bring about a lower quality-of-life. There was no significant association with quality-of-life of type 2 diabetes patients (Jing et al., 2018). Early & Stanley also found that there is a strong effectiveness of MNT on quality-of-life outcomes as well as clinical outcomes.

One clinical trial suggests that diets such as Mediterranean and whole food diets as well as diets high in omega-3 fatty acids, vitamin B6, folate, antioxidants and zinc may influence a person's risk for depression. While there are currently no dietary recommendations available specific to depression, a study summarized suggestions based on current published evidence-based research and practices. Recommendations included following a traditional diet pattern such as the Mediterranean diet, increasing fruit, vegetable and whole grain consumption. It also recommended high intake of nuts, seeds, omega-3 fatty acids and limited intake of processed foods. Adherence to these diet recommendations was found to be associated with a reduced probability as well as reduced risk of depression in an observational study. While there are currently no set dietary recommendations for depression, following these dietary recommendations may have a beneficial effect on depression as well as other comorbidities (Opie et al., 2017).

<center>Survey Tools</center>

The Beck Depression Inventory and the Appraisal of Diabetes Scale will be used as part of the survey tool (Jackson-Koku, 2016; Nair & Kachan, 2017). The Beck Depression Inventory (BDI) consists of 21-items used to evaluate the severity of depression in both normal and psychiatric populations (Jackson-Koku, 2016). The

<center>22</center>

Appraisal of Diabetes Scale was designed to evaluate thoughts related to having diabetes (Nair & Kachan, 2017). Both have been found to be appropriate for use in a clinical setting and are appealing for research with their short question length.

Beck Depression Inventory

The original format of the Beck Depression Inventory (BDI) was created in 1961 by Beck et al. (Jackson-Koku, 2016). The BDI was then revised in 1978 into the Beck Depression Inventory-II (BDI-II) to create a more appealing and easier to use format. The BDI-II is copyright and not available to the public while the original Beck Depression Inventory is available for public use and is the version that will be utilized in this project. The questionnaire is scored on a four-point scale from zero (no symptoms showing) to three (severe symptoms showing) (Jackson-Koku, 2016). Possible scores range from 0-63. Once a score is determined a level of depression can be assigned. Levels are these ups and downs are considered normal (1-10), mild mood disturbance (11-16), borderline clinical depression (17-20), moderate depression (21-30), severe depression (31-40) and extreme depression (41-63). The survey was used in a study completed in Italy to identify depressive symptoms and was found to have a reliability measure, Cronbach's alpha, of 0.85 (Martino et al., 2020).

Appraisal of Diabetes Scale

The Appraisal of Diabetes Scale (ADS) is a tool used to evaluate a person's quality-of-life specifically related to diabetes (Nair & Kachan, 2017). The ADS is a standardized and specific tool that was developed in 1991 (Carey et al., 1991). The scale has seven items and uses a five-point scale to score the participants. Scoring uses zero to represent the least effect of diabetes on quality-of-life and thirty-five to represent the

greatest effect of diabetes on quality-of-life (Nair & Kachan, 2017). The scoring is straight forward, making it useful and practical in clinical practice. The ADS is also a short survey taking only 3-5 minutes to complete which reduces the time burden for the respondents.

In a comparison of diabetes specific quality-of-life tools, the ADS is recommended for the evaluation of diabetes specific quality-of-life . The ADS was also noted to be desirable for a complete assessment, which is ideal when utilizing it for research purposes. Survey tools such as the Adult Diabetes-Dependent Quality-of-Life and Diabetes Quality-of-Life have issues related to feasibility, making them unappealing for use in the clinical setting. The ADS is noted to have achieved feasibility for use in the clinical setting as well as validity and reliability of Cronbach's alpha of 0.70. It has an all-encompassing scope of questions as well. Its overall reliability, validity and feasibility makes it a good survey tool for clinical research practice (Nair & Kachan, 2017).

<p style="text-align:center"><u>Summary</u></p>

In summary, type 2 diabetes mellitus is a chronic disease with a rising prevalence worldwide. Depression is a common comorbidity of type 2 diabetes which can cause a lessening in disease management. Diabetes requires self-adherence and self-management which can suffer when accompanied by depressive symptoms. Nutrition intervention has been successfully proven to help manage and even improve diabetes symptoms. However, it may not always address depressive symptoms and their effect on management. With the screening for the common comorbidity of depression in those with type 2 diabetes, nutrition professionals could be better informed of the patient's needs

and therefore, be able to refer patients to appropriate professionals and be better equipped

to tailor the patient's nutrition intervention.

CHAPTER 3

METHODS

The purpose of this study was to assess whether self-reported symptoms of depression, glycemic control, and report of an intervention by a Registered Dietitian Nutritionist had an impact on the quality-of-life in persons diagnosed with type 2 diabetes mellitus. The cross-sectional, online survey research design employed convenience sampling technique. The online questionnaire collected information including participant demographics and regarding RDN intervention. It also included the Appraisal of Diabetes Scale which measured thoughts and feelings about diabetes and the Beck Depression Inventory which assessed the presence of depressive symptoms. The questionnaire was created using Qualtrics XM (Qualtrics, Provo, UT) survey software and distributed via email and social media. Approval was obtained from the Louisiana Tech University Human Use Committee before data collection began (Appendix A). Survey data was analyzed using SPSS Version 26 software.

Participants

Eligible participants were adult men and women 18 years of age and older, living in the United States who had been diagnosed with type 2 diabetes mellitus. Participants who completed the survey were provided directions on how to enter a voluntary raffle for a $25 Amazon gift card. A winner was randomly selected and provided a gift card after

the closing of the survey. The target sample size was 250 participants. There were 148 total responses. One participant did not consent and was excluded from the analysis. There were 22 participants who did not meet the inclusion criteria and were therefore excluded from the data analysis. Participants who did not complete at least 75% of the survey were also excluded, this totaled 26 participants. The final sample size for analysis was 95 participants.

<u>Data Collection Instrument</u>

The data collection instrument used for this study was an online questionnaire designed using Qualtrics XM (Qualtrics, Provo, UT). To ensure anonymity, the software did not collect identifying information. All data was stored in Qualtrics XM until being downloaded for analysis. Participants were asked to provide data including age, gender, education level, race and region of residence within the United States. Participants then completed the Appraisal of Diabetes Scale, which indicated level of quality-of-life in persons with diabetes. Next the Beck Depression Inventory was completed which indicated if subjects were reporting symptoms of depression and the severity of those symptoms. The last section of the questionnaire was a self-efficacy assessment that was used in another study being completed in tandem with this one. The questionnaire was pilot tested by 10 adults who were not eligible for study participation to check for potential errors in the online format. After pilot testing was completed, the survey was revised and finalized.

<u>Data Collection Procedure</u>

The survey was disseminated through social media and personal email. An informational statement explaining the research study along with what participants could

expect from participation can be found in Appendix B. The survey link was posted to the following Facebook groups in order to reach the target audience of people with type 2 diabetes: Diabetes Support, Diabetes Support Group, Keto for Type 2 Diabetes, Diabetes support group. It was also disseminated on the personal Facebook page of the primary researcher. The survey was available 10 weeks. Reminder posts were made in groups encouraging completion prior to survey closure.

Data Analyses

The IBM Statistical Package for the Social Sciences (SPSS) Version 26 was used for statistical analysis. Response distributions for categorical variables were calculated using descriptive statistics. Participants' responses on the Appraisal of Diabetes Scale and Beck Depression Inventory were individually scored and assessed to determine the level of quality-of-life and presence of depressive symptoms. A Pearson correlation was used to determine the association between the scores of the Appraisal of Diabetes Scale and the Beck Depression Inventory. An ANOVA test was performed to compare range of reported glucose readings and participants quality-of-life scores. The scoring tools can be found in Appendix C.

CHAPTER 4

RESULTS

Demographic Data

One hundred forty-eight people responded to the online survey. Of the 148 responses, 95 were used for statistical analysis. Participants who did not meet the inclusion criteria, did not consent to participate in the survey or did not complete at least 75% of the survey were excluded from statistical analysis. Participants were located within all regions of the United States with the Midwest having the largest number of participants (n=34; 36%) and Southwest having the least number of participants (n=2; 2%). Participants were closely divided between female (52%) and male (48%) with the 40-49 year old age group having the highest percentage of participants (25%). The most frequently reported race was White, Non-Hispanic (58%). Participant education level varied, with having a Bachelor's degree being reported by 28% of the participants. Over half of the participants reported being employed with 48% of them having full-time employment and 16% reporting part-time employment. Participant demographics can be found in Table 1.

Table 1

Participant Demographics (*N*=95)

Characteristic	n (%)
Gender	
Male	45 (47)
Female	49 (52)
Age	
18-29	11 (12)
30-39	20 (21)
40-49	24 (25)
50-59	18 (19)
60-69	9 (10)
70-79	8 (8)
80-89	2 (2)
Education	
< High School	3 (3)
High School or equivalent	23 (24)
Technical Certification	14 (15)
Associate's Degree	14 (15)
Bachelors	27 (28)
Masters	11 (12)
Doctorate	2 (2)
Region	
New England	7 (7)
Mid-Atlantic	17 (18)
Midwest	34 (36)
South	18 (19)
Southwest	2 (2)
West	17 (18)
Race	
Black/African American Hispanic	11 (12)
Black/African American Non-Hispanic	4 (4)
American Indian/Alaskan Native	5 (5)
White, Hispanic	20 (21)
White, Non-Hispanic	55 (58)
Employment	
Full Time	46 (48)
Part Time	15 (16)
Retired	24 (25)
Disabled	2 (2)
Not employed	7 (7)

Note: Note any categories with less than 95 responses had no more than 3% missing responses.

Because not all participants completed the survey in full, the sample size for Beck Depression Inventory (BDI) Scores and Appraisal of Diabetes (ADS) scores is less than the total represented in Table 1. Seventy-four participants completed the Beck Depression Inventory and eighty completed the Appraisal of Diabetes Scale questions. Overall mean and standard deviations for those participants who completed the Appraisal of Diabetes Scale and Beck Depression Inventory are reported in Table 2.

Table 2

Beck Depression Inventory and Appraisal of Diabetes Scores (*N*=95)

Scale	*n (%)*	*M*	*SD*
Beck Depression Inventory	74 (76)	16.92	12.28
Appraisal of Diabetes Scale	80 (82)	19.99	3.75

Note: Beck Depression Inventory score ranges: 0-63. Appraisal of Diabetes Scale score range: 5-35.

The Appraisal of Diabetes scores had a possible range of 5 to 35. Participant scores ranged from 10 to 29. The median score was 19.99 ± 3.75. The authors of the tool do not provide interpretation for individual scores however, the interpretation is straightforward. The lower the total score, the more positive the appraisal strategy. Therefore, the lower the score the higher the diabetes quality-of-life. For descriptive and analytical purposes, the participants were divided into quartiles. The breakdown of quartiles and frequency of each are displayed in Table 3.

The Beck Depression Inventory scores had a possible range of 0 to 63. These scores can be placed into six categories which are "these ups and downs are considered normal," "mild mood disturbance," "borderline clinical depression," "moderate depression," "severe depression" and "extreme depression." The higher the score the higher the level of depression. Participant scores ranged from two to fifty with the

average score being 16.92±12.28. Approximately one-third (36%) of the participants had

scores indicating normal ups and downs. Almost half (44%) had scores indicating some

level of depression. These frequencies are reported in Table 4. The Beck Depression

Inventory scores and Appraisal of Diabetes Scale scores had a significant positive

correlation, $r(72)=.00, p<.01$, indicating those with fewer depressive symptoms had

reported a higher diabetes quality-of-life.

Table 3

Frequency of Participant Appraisal of Diabetes Score by Quartiles (*n*=80)

Scores	*n (%)*	
Total	80 (100)	
10-18	24 (30)	
19-20	18 (23)	
21-22	18 (23)	
23-29	20 (25)	

Table 4

Frequency of Participant Levels of Depression Based on Beck Depression Inventory
(*n*=74)

Levels of Depression	*Range*	*n (%)*
Total	0-63	74 (100)
These ups and downs are considered normal	0-10	27 (36)
Mild mood disturbance	11-16	9 (12)
Borderline clinical depression	17-20	6 (8)
Moderate depression	21-30	22 (30)
Severe depression	31-40	8 (11)
Extreme depression	41-63	2 (3)

Demographics and Appraisal of Diabetes Scores

Appraisal of Diabetes Scale scores by gender, age and race are reported in Table

5. Female ADS scores ranged from 14 to 29 and scores for males ranged from 10 to 29.

An independent samples t-test determined there was no significant difference in

Appraisal of Diabetes scores between males (*M*=20.33, *SD*=3.10) and females (*M*=19.67, *SD*=4.28); *t*(79)=0.80, *p*=0.43. The frequency of males and females within each quartile was similar. A Kendall's tau test examining the distribution of Appraisal of Diabetes Scale score among the quartiles was not significant (p=0.719).

The 40-49 and 60-69 year old age groups had the largest range (10-29) of ADS scores. A one-way ANOVA determined there was no difference in Appraisal of Diabetes Scale scores between age groups (M=19.99, SD= 3.74); $F(6, 71) = 0.53$, *p*=.782. Half of the participants in the 30-39 age were in the third quartile. Almost half (46%) of the participants aged 50-59 were in the first quartile. All other age groups had fairly even distribution of scores. A Kendall's tau test examining the Appraisal of Diabetes Scale score among the quartiles was not significant (*p*=.387). White, Non-Hispanics had the largest range of 10-29. A one-way ANOVA determined there was no significant difference in Appraisal of Diabetes Scale scores between races (M=20.00, SD= 3.77); $F(4, 75) = .413$, *p*=.799. The frequency within each quartile was fairly evenly distributed among races. A Kendall's tau test examining the Appraisal of Diabetes Scale score among the quartiles was not significant (*p*=0.909).

Table 5

Appraisal of Diabetes Scale by Gender, Age and Race (*n*=80)

Characteristics	*n (%)*	*Range*	*M (SD)*	*1*	*2*	*3*	*4*
				ADS[a] Quartiles			
Total	80	10-29	19.99 (3.75)	24	18	18	20
Gender							
Females	38 (47)	14-29	20.33 (3.10)	10	8	12	8
Males	42 (53)	10-29	19.67 (4.28)	14	10	6	12
Age							
18-29	11 (14)	17-25	20.00 (2.53)	3	4	2	2
30-39	18 (23)	15-29	20.88 (2.22)	3	3	9	3
40-49	19 (24)	10-29	20.61 (4.38)	5	3	5	6
50-59	15 (19)	14-27	19.00 (3.79)	7	3	1	4
60-69	8 (10)	10-29	19.89 (5.18)	3	2	1	2
70-79	5 (6)	13-24	18.80 (5.07)	2	1	-	2
80-89	2 (3)	15-19	17.00 (2.83)	1	1	-	-
Missing	2 (2)						
Race							
B/AA [b]Hispanic	10 (13)	14-25	21.30 (3.47)	2	1	4	3
B//AA NH[c]	1 (1)	21	21.00 (-)	-	-	1	0
AI[d]/AN[e]	5 (6)	15-24	19.80 (3.27)	1	2	1	1
White, Hispanic	17 (21)	14-27	19.41 (3.22)	7	5	2	3
White, NH[f]	47 (59)	10-29	19.94 (4.12)	14	10	10	13

Note: Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale. [b]Black/African American; [c]Black/African American Non-Hispanic; [d]American Indian; [e]Alaskan Native; [f]Non-Hispanic

Appraisal of Diabetes Scale scores by education level are reported in Table 6. Those with Bachelor's degrees had the largest range of ADS scores (10-29). A one-way ANOVA determined no difference in Appraisal of Diabetes Scale scores between education levels (M=19.96, SD= 3.76); $F(6, 73) = 5.94$, $p=.876$. Of those with an Associate's degree, half were in the first quartile and of those with a Bachelor's degree approximately 40% were in the first quartile. A Kendall's tau test examining the Appraisal of Diabetes Scale score among the quartiles was not significant ($p=0.920$).

Those retired had the largest range of scores (10-29). A one-way ANOVA determined no significant difference among Appraisal of Diabetes Scale scores by participant employment status, $F(4, 75) = 1.32$, $p = .27$. There was a fairly even distribution of scores for participants among employment levels. A Kendall's tau test examining Appraisal of Diabetes Scale score among the quartiles was not significant (p=.101).

Participants located in New England had the smallest range (19-23) of ADS scores and those in the West had the largest (10-29). A one-way ANOVA determined no significant difference among Appraisal of Diabetes Scale scores by location/region of participants, $F(5, 75) = 0.86$, $p = .51$. New England did not have any scores falling in the first quartile and Southwest did not have any scores in the first two quartiles. A Kendall's tau test examining Appraisal of Diabetes Scale score among quartiles was not significant (p=.564).

Table 6

Appraisal of Diabetes Scale by Education Level, Employment Status and Location/Region (n=80)

				ADS[a] Quartiles			
Characteristic	*n (%)*	*Range*	*M (SD)*	*1*	*2*	*3*	*4*
Total	79 (99)	10-29	19.96 (3.76)	24	18	17	20
Education Level							
< High School	3 (4)	19-21	20.00 (1.00)	-	2	1	-
HS[b] Diploma or EQ[c]	16 (20)	14-29	20.88 (3.72)	3	4	3	6
Technical Cert[d]	12 (15)	17-24	20.50 (2.50)	2	5	2	3
Associate's Degree	12 (15)	10-25	18.83 (4.28)	6	2	2	2
Bachelor's Degree	26 (33)	10-29	19.62 (4.52)	11	1	8	6
Master's Degree	8 (10)	14-24	20.00 (3.55)	2	3	-	3
Doctoral Degree	3 (4)	20-22	20.33 (1.53)	-	1	1	-
Missing	1 (1)						
Employment Status							
Employed; FT[e]	39 (49)	10-26	20.26 (1.00)	9	8	12	10
Employed; PT[f]	12 (15)	14-24	20.08 (3.72)	3	4	2	3
Retired	20 (25)	10-29	18.71 (2.50)	10	4	1	5
Disabled	1 (1)	18	18.00 (4.28)	1	-	-	-
Not Employed	7 (9)	18-29	22.14 (4.52)	1	2	2	2
Missing	1 (1)						
Location/Region							
New England	5 (6)	19-23	20.40 (1.67)	-	3	1	1
Mid-Atlantic	13 (16)	15-26	19.54 (3.28)	5	4	2	2
Midwest	28 (35)	10-27	19.64 (4.35)	8	6	5	9
South	15 (19)	15-25	19.75 (2.79)	6	4	2	3
Southwest	2 (3)	20-29	25.00 (5.66)	-	-	1	1
West	17 (21)	10-29	20.41 (4.05)	5	1	7	4

Note: Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale. [b]High school. [c]Equivalent. [d]Certification. [e]Full-time [f]PT= Part-time.

Demographics and Beck Depression Inventory

Beck Depression Inventory scores by gender, age and race are reported in Table

7. Female BDI scores ranged from 2-50 and for males ranged from 3-44. An independent

samples t-test determined there was a significant difference in Beck Depression Inventory

scores for men (*M*= 15.90, SD= 10.40) and females (*M*=18.09, *SD*= 14.19); *t*(73)= 0.76, *p*=0.03. For both sexes, the most frequent levels of depression category were "these ups and downs are considered normal" and "moderate depression.". A Kendall's tau test examining the distribution of Beck Depression Inventory score among depression levels was not significant (*p*=.143).

A one-way ANOVA determined no significant difference in Beck Depression Inventory scores among age groups, *F*(6, 62) = 1.88, *p*=.10. There were only 2 participants in the "extreme depression" category, one from the 60-69 age group and one from the 80-89 age group. The 50-59 and 60-69 age group had majority of the scores in the "these ups and downs are considered normal" category. A Kendall's tau test examining Beck Depression Inventory score among levels was not significant (*p*=.052)

A one-way ANOVA determined no difference in Beck Depression Inventory scores and race, *F*(4, 76) = 0.42, *p* = .79. Distribution of frequencies between each category was fairly even. A Kendall's tau test examining Beck Depression Inventory scores among the levels was not significant (*p*=.228).

Table 7

Beck Depression Inventory by Gender, Age and Race (*n*=74)

Characteristic	*n (%)*	*Range*	*M (SD)*	BDI[a] Levels of Depression					
				1[b]	2[c]	3[d]	4[e]	5[f]	6[g]
Total	74 (100)	2-50	16.92 (12.28)	27	9	6	22	8	2
Gender									
Female	34 (46)	2-50	18.09 (14.19)	11	3	3	9	7	1
Male	40 (54)	3-44	15.90 (10.40)	16	6	3	13	1	1
Age									
Total	72 (97)	2-50	17.46 (12.40)	27	8	6	21	8	2
18-29	11 (15)	2-40	19.73 (12.22)	3	-	1	6	1	-
30-39	16 (22)	2-39	23.36 (11.05)	4	1	2	4	5	-
40-49	16 (22)	2-36	18.60 (11.22)	5	2	1	7	1	-
50-59	15 (20)	2-28	11.00 (8.24)	9	2	1	3	-	-
60-69	8 (11)	3-50	11.89 (15.10)	5	2	-	-	-	1
70-79	4 (5)	19-32	15.40 (14.36)	1	-	1	1	1	-
80-89	2 (3)	11-44	27.50 (23.33)	-	1	-	-	-	1
Missing	2 (3)								
Race									
B/AA H[h]	7 (9)	2-40	23.14 (13.04)	1	1	1	2	2	-
B/AA NH[i]	1 (1)	35	35.00 (-)	-	-	-	-	1	-
AI/AN[j]	5 (7)	2-32	17.60 (15.71)	2	-	-	1	2	0
White, H[k]	16 (22)	2-32	14.81 (11.27)	7	1	2	5	1	-
White,NH[l]	45 (61)	2-50	16.24 (12.06)	17	7	3	14	2	2

Note: Beck Depression Inventory score ranges: 0-63. [a]Beck Depression Inventory [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression. [h]Black/African American Hispanic; [i]Black/African American Non-Hispanic; [j]American Indian/Alaskan Native; [k]Hispanic; [l]Non-Hispanic

Beck Depression inventory score by education level, employment and location/region are reported in Table 8. BDI scores for High school diploma or equivalent ranged from 2-44, those with Technical Certification's ranged from 5-35, Associate's Degree's ranged from 3-32, Bachelor's Degree's ranged from 2-50, Master's Degree's ranged from 2-40 and Doctoral degree's ranged from 8-16. A one-way ANOVA determined no significant difference among Beck Depression Inventory scores among

education level, $F(6, 68) = 1.35, p = .23$. The distribution of frequencies within each category is displayed in the table. While not statistically significant, the distribution of frequency in category 1 ("these ups and downs are considered normal") for those with higher education was different than the total sample. Overall 36% of the respondents were in this category. However 66% of those with an Associate's degree, 44%of those with a Bachelors degree, and 50% of those with a Master's degree and Doctoral degree were in that category. However, a Kendall's tau test examining the Beck Depression Inventory Scale score among the categories was not significant (p=.676).

Those retired had the largest range of BDI scores (3-50). A one-way ANOVA determined no significant difference among Beck Depression Inventory scores by employment status, $F(4, 70) = 0.65, p = .63$. The distribution of frequencies within each category is displayed in the table. The only 2 participants that scored in category 6 (extreme depression) reported being retired. A Kendall's tau test examining Beck Depression Inventory score among the levels was not significant ($p=.198$)

A one-way ANOVA determined no significant difference among Beck Depression Inventory scores by location/region, $F(5, 69) = 1.16, p = .34$. Overall 30% of participants fell within category 4 (moderate depression) however 55% of those were from the Midwest creating an uneven distribution. A Kendall's tau test examining Beck Depression Inventory score among the levels was not significant ($p=.615$).

Table 8

Beck Depression Inventory by Education Level, Employment Status and Location/Region (*n*=74)

Characteristic	n (%)	Range	M (SD)	1[b]	2[c]	3[d]	4[e]	5[f]	6[g]
				BDI[a] Levels of Depression					
Total	74 (100)	2-50	16.92 (12.28)	27	9	6	22	8	2
Education Level									
< HS[h]	2 (3)	23	23.00 (0.00)	-	-	-	2	0	0
HS Diploma Eqt[i]	16 (22)	2-44	21.94 (11.56)	2	3	1	7	2	1
Technical Cert	12 (16)	5-35	19.25 (12.14)	3	1	2	4	2	-
Associate's Degree	9 (12)	3-32	10.78 (10.00)	6	1	-	1	1	0
Bachelor's Degree	25 (34)	2-50	15.12 (12.91)	11	3	2	7	1	1
Master's Degree	8 (11)	2-40	17.63 (14.29)	4	-	1	1	2	-
Doctoral Degree	2 (3%)	8-16	8.33 (7.51)	1	1	-	-	-	-
Employment Status									
Employed; FT[j]	36 (49)	2-39	17.61 (10.64)	11	5	2	15	3	-
Employed; PT[k]	11 (15)	2-40	20.55 (16.12)	4	-	-	2	5	-
Retired	19 (26)	3-50	13.60 (14.13)	11	2	1	3	-	2
Disabled	1 (1)	13	13.00 (-)	-	1	-	-	-	-
Not Employed	7 (9)	2-27	17.71 (8.12)	1	1	3	2	-	-
Location/Region									
New England	5 (7)	5-32	19.80 (15.45)	2	-	-	1	2	-
Mid-Atlantic	11 (15)	2-40	17.82 (15.26)	5	-	1	2	3	-
Midwest	27 (36)	2-44	17.00 (11.01)	9	2	3	12	-	1
South	14 (19)	4-32	13.00 (10.20)	6	4	-	3	1	-
Southwest	2 (3)	18-50	34.00 (22.63)	-	-	1	-	-	1
West	15 (20)	2-39	16.80 (11.60)	5	3	1	4	2	-

Note: Beck Depression Inventory score ranges: 0-63,[a]Beck Depression Inventory [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression. [i]Equivalent. [j]Full-Time. [k]Part-Time

<u>Reported Medical Conditions</u>

Participants were asked to report their symptoms and select medical conditions. The majority of participants (56%) reported having hypertension, and 53% self-reported being overweight, as well. The frequency of each condition and sum of participant comorbidities reported are Table 9. The number of comorbidities present was summed to

create variable for analysis, "sum of comorbidities". Sum of comorbidities was determined by totaling the number of reported medical conditions of each individual participant based on a given list of co-morbidities. The sum of comorbidities ranged from 0-5 and participants were placed in each category based on their total number of reported other medical conditions.

Table 9

Frequency of Reported Disease and Sum of Comorbidities by Participants (*n*=95)

Characteristic	*n (%)*
Disease	
Hypertension	53 (56)
Obesity	50 (53)
Chronic Heart Disease	9 (9)
Chronic Kidney Disease	6 (6)
Peripheral Vascular Disease	8 (8)
Foot Ulcer	4 (4)
Reduction of eyesight	9 (9)
Gastrointestinal Upset	18 (19)
Tingling	17 (18)
Sum of Comorbidities	
0	4 (4)
1	36 (38)
2	35 (37)
3	14 (15)
4	4 (4)
5	2 (2)

Sum of comorbidities and Appraisal of Diabetes Scale scores are reported in Table 10. As the sum of comorbidities score increased, the mean ADS score increased indicating lower diabetes related quality-of life. Pearson's correlation between Appraisal of Diabetes Scale scores and participant sum of comorbidities was found to be significantly correlated, $r(80)=0.29$, $p>.01$. Sum of comorbidities and Beck Depression Inventory scores are reported in Table 11. A Pearson's correlation between Beck Depression Inventory scores and participant sum of comorbidities was found to be

significantly correlated, $r(93)=0.44$, $p >.01$. As the sum of comorbidities score increased so did the BDI scores indicating higher depressive symptoms.

Table 10

Sum of Comorbidities and Appraisal of Diabetes Scores (n=80)

Sum of Comorbidities	n (%)	M (SD)	ADS[a] Quartiles			
			1	2	3	4
Total	80 (100)	20.00 (3.77)	24	18	18	20
0	3 (4)	17.67 (3.06)	2	-	1	-
1	30 (38)	19.40 (3.60)	11	6	7	6
2	28 (35)	19.54 (4.12)	10	6	6	6
3	14 (18)	21.93 (2.92)	-	5	4	5
4	4 (5)	21.25 (3.20)	1	1	-	2
5	1 (1)	26.00 (-)	-	-	-	1

Note: Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale

Table 11

Sum of Comorbidities and Beck Depression Inventory Scores (n=74)

Sum of Comorbidities	n (%)	M (SD)	BDI[a] Levels of Depression					
			1[b]	2[c]	3[d]	4[e]	5[f]	6[g]
Total	74 (100)	17.14 (12.22)	27	9	6	22	8	2
0	3 (4)	25.67 (14.05)	-	1	-	1	1	-
1	24 (32)	15.25 (10.94)	11	1	1	9	2	-
2	28 (38)	15.00 (11.24)	11	4	2	8	3	-
3	14 (19)	21.71 (14.05)	3	2	3	3	2	1
4	4 (5)	22.75 (17.04)	1	1	-	1	-	1
5	1 (1)	10.00 (-)	1	-	-	-	-	-

Note: Beck Depression Inventory score ranges: 0-63. [a]Beck Depression Inventory [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression

<u>Initial Registered Dietitian Nutritionist Visit</u>

A majority of the participants (71%) stated that a physician or medical professional recommended that they see a RDN for diabetes management. However, only 57% (n=54) stated that they had done so. Two participants stopped the survey at that point. In the questionnaire, if participants answered "yes" to having seen a RDN for

diabetes management, they went on to answer a series of questions related to that visit. If they answered "no," participants skipped all questions related to RDN consult and continued with the remainder of the questionnaire.

Appraisal of Diabetes Scale by comparing those who had met with a RDN with those that had not met with a RDN are in Table 12. An independent sample t-test determined no significant difference among quality-of-life between those who met with a RDN for diabetes management or not and their Appraisal of Diabetes Scale scores, $t(78)=$ 0.37, $p >.05$. There was fairly even distribution among ADS quartiles for both groups. A Pearson Chi-Square test examining Appraisal of Diabetes Scale score among quartiles was not significant ($p=.515$).

Table 12

Appraisal of Diabetes Scores by Met with a RDN (n=80)

			ADS[a] Quartiles			
Met with RDN	*n (%)*	*M (SD)*	*1*	*2*	*3*	*4*
Total	80(100)	20.00 (3.77	24	18	18	20
Yes	47 (59)	19.72 (3.32)	16	9	12	10
No	33 (41)	20.39 (4.35)	8	9	6	10

Note: Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale.

Beck Depression Inventory by comparing those who had seen a RDN with those that had not seen a RDN are in Table 13. There was no significant difference in BDI scores between those who had seen a RDN (M=16.12, SD=12.20) and those who had not seen a RDN (M=18.47, SD=12.30); t(72)=.818, p=0.416. A Kendall's tau test determined there was no significant difference among depression levels for those who had met with a RDN and those who had not (p=.401).

Table 13

Beck Depression Inventory by Met with a RDN (n=74)

Met with RDN	*n (%)*	*M (SD)*	BDI[a] Levels of Depression					
			1[b]	*2[c]*	*3[d]*	*4[e]*	*5[f]*	*6[g]*
Total	74 (100)	17.14 (12.22)	27	9	6	22	8	2
Yes	42 (57)	16.12 (12.20)	17	5	4	10	6	-
No	32 (43)	18.47 (12.30)	10	4	2	12	2	2

Note: Beck Depression Inventory score ranges: 0-63. [a]Beck Depression Inventory. [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression

Of those that met with a RDN and continued the survey (n =52), 18 (35%) stated they were told to see a RDN for counseling 0-4 weeks after diagnosis, 22 (42%) stated they were told to see a RDN 1-6 months after diagnosis and 12 (23%) said it was 6 months or more after diagnosis that they were told to see a RDN. This data can be seen in Table 14.

Table 14

Length After Diagnosis Before RDN Consult was Recommended (*n=52*)

Length of Time After Diagnosis Recommendation was Made to See RDN	*n (%)*
0-4 weeks	18 (35)
1-6 months	22 (42)
6+ months	12 (23)

A comparison of Appraisal of Diabetes Scale scores for those who met with a RDN by the length of time from their diagnosis to RDN consult recommendation and satisfaction with time to get an appointment are reported Table 15. There was a significant difference found among overall mean scores based on length of time between diabetes diagnosis groupings and RDN consultation recommendation, $F(2, 44) = 4.98$, $p = .01$. A Person's correlation was performed between ADS scores and the length of time

from diagnosis to recommendation to see a RDN and a moderate significant positive correlation was found $r=.420$, $p=0.003$ This indicated that those participants who received a recommendation to see a RDN within 4 weeks of their type 2 diabetes diagnosis had lower their Appraisal of Diabetes Scale score, meaning they reported a higher diabetes related quality-of-life. A Kendall's tau test determined a significant difference in distribution of scores among Appraisal of Diabetes quartiles ($p=.000$).

Participants who met with a RDN were also asked whether they were satisfied with the time it took to get an appointment and see a RDN from the time they were referred. An independent samples t-test determined there was no significant difference in Appraisal of Diabetes scores between those who were satisfied with the length of time it took to get an appointment (M=19.70, SD=3.55) and those who were not satisfied (M=19.50, SD=2.67); t(8)=.152, p =.880. A Kendall's tau test determined there was no significant difference between distribution of Appraisal of Diabetes scores by whether or not participants were satisfied with length of time to meet with a RDN after referral ($p=1.00$).

Table 15

Appraisal of Diabetes Scale by Time from Diagnosis to RDN Consult Recommendation and Satisfaction with Time to Get Appointment (*n*=52)

Characteristic	n (%)	M (SD)	ADS[a] Quartiles 1	2	3	4
Total	52(100)					
Time from Diagnosis to RDN Recommendation						
0-4 weeks	17 (33)	17.94 (2.75)	9	4	4	-
1-6 months	19 (37)	20.32 (3.35)	6	2	5	6
6+ months	11 (23)	19.72 (3.01)	1	3	3	4
Missing	5 (10)					
Satisfied with Time to Get Appointment						
Yes	37 (71)	19.70(3.55)	13	7	8	9
No	8 (15)	19.50(2.67)	3	2	2	1
Missing	7 (13)					

Note: Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale.

Beck Depression Inventory by timeframe from diagnosis to recommendation for RDN consult and satisfaction with time to get an appointment are reported in Table 16. A correlation was performed between Beck Depression Inventory scores and the length of time between type 2 diabetes diagnosis and receiving a recommendation to see a RDN and a weak, positive correlation $r(93)=0.19$, $p >.01$. As the length of time increased from diagnosis to receiving a RDN consult recommendation, the Beck Depression Inventory score increases. The majority of participants who received a RDN consult recommendation within 0-4 weeks of diagnosis (71%) fell within depression level 1 (these ups and downs are normal). Of those who were within the first level of depression (n=17), 71% had a RDN consult recommendation within 0-4 week, 24% within 1-6 months and 6% within more than 6 months after diagnosis. An independent t-test was run and there was not a significant difference in Beck Depression Inventory scores and those who were or were not satisfied; $t(38)=-2.69$, $p=.010$.

Half of participants who were satisfied with the time it took to see a RDN after referral fell within depression level 1 (these ups and downs are considered normal). Those who were not satisfied had half of participants fall within level 4 (moderate depression). No participant fell within level 6 for this question. A Kendall's tau test determined significance between distribution of Beck Depression Inventory scores for whether participants were satisfied with the time it took to see a RDN after they were initially referred ($p=.004$). An independent samples t-test determined there was no significant difference in mean Beck Depression Inventory scores between those satisfied with the amount of time to get an appointment ($M=13.16$, $SD=11.32$) and those not satisfied ($M=25.13$, $SD=10.89$); $t(38)=0.83$, $p=0.37$.

Table 16

Beck Depression Inventory by Time from Diagnosis to RDN Consult Recommendation and Satisfaction with Time to Get an Appointment (*n*=52)

Characteristic	n (%)	M (SD)	BDI[a] Levels of Depression					
			1[b]	2[c]	3[d]	4[e]	5[f]	6[g]
Time from Diagnosis to RDN Recommendation								
0-4 weeks	17 (33)	10.53 (11.93)	12	1	1	1	2	-
1-6 months	16 (31)	17.69 (11.63)	4	2	3	5	2	-
6+ months	9 (17)	23.89 (9.25)	1	2	-	4	2	-
Missing	10 (20)							
Satisfied with Time to Get Appointment								
Yes	32	13.16(11.32)	16	5	2	6	3	-
No	8	25.13(10.90)	1	-	1	4	2	-
Missing	20							

Note: Beck Depression Inventory score ranges: 0-63, [a]Beck Depression Inventory. [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression.

Participants who met with a RDN were asked to report whether they felt the RDN helped improve their diabetes management. There were 5 missing responses for this

question. There were 40 participants who reported "yes" to feeling that the RDN helped improve their diabetes management and 7 participants who reported "no." Appraisal of Diabetes Scale by RDN improved diabetes management, diet change recommendation and percent diet changed are reported in Table 17. There was no significance found between Appraisal of Diabetes or Beck Depression Inventory scores by whether participants felt the RDN helped improve their diabetes management. While there was no significance, Beck Depression Inventory mean score for those who felt the RDN helped them with diabetes management (M=14.39, SD=12.71) was lower than those who felt the RDN did not help (M=21.17, SD=9.39) indicating fewer depressive symptoms.

Participants were asked if the RDN recommended diet changes at their initial visit. The majority, 94% (n=49), reported yes and the remaining 3 reported no to having diet changes recommended at their initial RDN visit. Those who answered yes were then asked the degree to which they were able to make changes. Options were presented as percentages, 0%- no changes were made, 25%- minimal changes were made, 50%- moderate changes were made, 75%- significant changes were made and 100%- I have a completely different diet now. No participant reported that no changes were made. 27% of participants reported making minimal changes, 56% reported making moderate changes, 15% reported making significant changes and 2% reported having a completely different diet. An ANOVA found no significance among diet changes made after participant initial RDN consult and Beck Depression Inventory (M=15.73, SD=0.00); $F_{(3, 36)}$=2.25, p=.099 or Appraisal of Diabetes scores (M=19.61, SD=3.34); $F_{(3, 40)}$=1.34, p=279. Dietary changes made by participants after meeting with a RDN did not have a significant effect on their quality of life or depression level.

Table 17

Appraisal of Diabetes Scale by RDN Improved Diabetes Management, Diet Change Recommendation and Percent Diet Changed (*n*=52)

			ADS[a] Quartiles			
Characteristic	*n (%)*	*M (SD)*	*1*	*2*	*3*	*4*
RDN Improved Diabetes Management						
Yes	38	19.37 (3.39)	15	6	9	8
No	6	22.00 (2.61)	-	2	2	2
Missing	8					
Changes Recommended						
Yes	44	19.61(3.34)	16	7	12	9
No	3	21.33 (3.21)	0	2	0	1
Missing	5					
Percent Diet Changed						
0%- no changes	-		-	-	-	-
25%- minimal changes	11	21.00 (2.90)	2	2	3	4
50%- moderate changes	25	19.48 (3.16)	10	3	8	4
75%- significant changes	7	17.86 (4.30)	4	1	1	1
100%- completely changed	1	20.00 (-)	-	1	-	-

Note: Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale.

Table 18

Beck Depression Inventory by RDN Improved Diabetes Management, Diet Change Recommendation and Percent Diet Changed (*n*=52)

			BDI[a] Levels of Depression					
	n (%)	*M (SD)*	*1[b]*	*2[c]*	*3[d]*	*4[e]*	*5[f]*	*6[g]*
RDN Improved Diabetes Management								
Yes	33	14.39 (12.71)	16	3	4	6	4	-
No	6	21.17 (9.39)	1	2	-	1	2	-
Missing								
Changes Recommended								
Yes	40	15.73 (12.24)	17	4	4	10	5	-
No	2	24.00 (11.31)	-	1	-	-	1	-
Missing	10							
Percent Diet Changed								
0%- no changes								
25%- minimal changes	9	18.78 (9.61)	2	2	1	3	1	-
50%- moderate changes	24	17.58 (13.06)	9	2	2	7	4	-
75%- significant changes	6	6.00 (7.24)	5	-	1	-	-	-
100%- completely changed	1	2.00 (-)	1	-	-	-	-	-

Note: Beck Depression Inventory score ranges: 0-63, [a]Beck Depression Inventory. [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression

Type of Consultation

Participants were asked about the method in which they met with a RDN for consultation. Options included in-person, telehealth or both. Appraisal of Diabetes Scale and Beck Depression Inventory scores by method of RDN consultation are reported in Table 19. There was no significant difference found among Appraisal of Diabetes Scale score by method of consultation, $F(2, 44) = 0.47$, $p = .63$, or Beck Depression Inventory scores, $F(2, 40) = 0.31$, $p = .74$.

Table 19

Appraisal of Diabetes Scale and Beck Depression Inventory by Method of RDN Consultation (*n*=52)

	ADS[a] Scores		BDI[b] Scores	
Method of Consult	*n (%)*	*M (SD)*	*n*	*M (SD)*
Total	47 (90)	19.72 (3.32)	43 (83%)	15.77 (12.27)
In-Person	30 (64)	19.37 (3.48)	28 (65%)	14.68 (12.98)
Telehealth	10 (21)	20.40 (3.37)	9 (21%)	17.67 (10.46)
Both	7 (15)	20.29 (2.69)	6 (14%)	18.00 (12.68)
Missing	5 (10)		9 (17%)	

Note: Beck Depression Inventory score ranges: 0-63, Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale. [b]Beck Depression Inventory.

Length of Time Spent with RDN and Number of Follow-Up Appointments

Participants were asked to identify the amount of time spent with the RDN at their initial visit as well as how many more visits they had after their initial appointment. For the question regarding number of follow-up appointments after the initial appointment, groupings were created for analysis. Participants most frequently spent 30 minutes with a RDN for consultation (40%); the majority reported having 1-2 follow-up appointments with the RDN after their initial visit (58%). Participant length of time spent with RDN at Initial Visit and number of follow-up appointments are reported in Table 20.

Table 20

Participants Length of Time Spent with RDN at Initial Visit and Number of Follow-Up Appointments (N=95)

Characteristic	*n (%)*
Consult Length	
Total	52 (55)
<30 min	4 (8)
30 min	21 (40)
45 min	10 (19)
60 min	10 (19)
>60 min	7 (13)
Missing	43 (45)
Number of Follow Up Visits with RDN	
Total	50 (53)
0	5 (10)
1-2	29 (58)
3-4	8 (16)
≥5	8 (16)
Missing	45 (47)

Appraisal of Diabetes Scale by length of time spent with RDN at initial visit and number of follow-up appointments are reported in Table 21. An ANOVA found no difference among mean scores for Appraisal of Diabetes Scale and amount of time spent with the RDN for consult, (M=19.73, SD=3.32); $F(4, 42)$=0.28, p=.890. There was a fairly even distribution of scores for all amounts of time spent with the RDN for consult. A Kendall's tau test found no significant difference among the distribution of Appraisal of Diabetes Scale scores among quartiles and length of time spent with a RDN at initial visit, p = .710.

It appears as participants increased the number of visits with the RDN, they had lower Appraisal of Diabetes scores indicating a higher diabetes related quality-of-life however it was not statistically significant (p=0.945). A Kendall's tau test determined

there was no significant difference the distribution of ADS scores among categories by

number of follow-up appointments, *p*= .819.

Table 21

Appraisal of Diabetes Scale by Length of Time Spent with RDN at Initial Visit and Number of Follow Up Appointments (*n*=52)

			ADS[a] Quartiles			
Characteristic	*n (%)*	*M (SD)*	*1*	*2*	*3*	*4*
Consult Length						
Total	47 (90)	19.72 (3.32)	16	9	12	10
<30 min	3 (6)	18.00 (1.73)	2	1	-	-
30 min	18 (38)	19.83 (3.65)	6	2	6	4
45 min	10 (21)	20.30 (3.47)	2	2	4	2
60 min	9 (19)	19.44 (3.43)	4	2	1	2
>60 min	7 (15)	19.71 (3.15)	2	2	1	2
Missing	5 (10)					
Number of Follow Up Appointments with RDN						
Total	46 (88)	19.77 (3.33)	15	9	12	10
0	4 (7)	20.75 (5.74)	1	1	-	2
1-2	27 (52)	19.63 (3.04)	9	6	7	5
3-4	7 (13)	19.86 (3.72)	2	-	4	1
≥5	8 (15)	19.75 (3.24)	3	2	1	2
Missing	6 (12)					

Note: Appraisal of Diabetes Scale score range: 5-35. Two responses missing for follow-up visits with RDN. [a]Appraisal of Diabetes Scale.

The Beck Depression Inventory results by length of time spent with RDN at initial visit and number of follow-up appointments are reported in Table 22. The length of time spent with a RDN at participant's initial consult did not significantly impact BDI scores (*p*=0.845). A Kendall's tau test found no significance in the distribution of Beck Depression Inventory scores and length of time spent with a RDN, *p* = .524.

It appears that those who had more follow up visits were more likely to have lower depression scores, however, an ANOVA found no significant difference in Beck Depression Inventory scores by number of follow up visits , $F(5, 35) = 0.70$, *p* = .626. A

Kendall's tau test found no significance among Beck Depression Inventory scores for the number of follow-up appointments participants had with a RDN, $p = .535$.

Table 22

Beck Depression Inventory by Length of Time Spent with RDN at Initial Visit and Number of Follow Up Appointments (*n*=52)

Characteristic	n (%)	M (SD)	BDI[a] Levels of Depression					
			1[b]	2[c]	3[d]	4[e]	5[f]	6[g]
Consult Length								
<30 min	3 (7)	13.33 (6.43)	1	1	1	-	-	
30 min	18 (43)	18.50 (12.37)	5	3	2	5	3	
45 min	8 (19)	15.50 (14.35)	4	-	-	3	1	
60 min	8 (19)	12.75 (12.42)	5	1	-	-	2	
>60 min	5 (12)	15.60 (13.01)	2	0	1	2	-	
Missing	10 (19)							
Number of Follow Up Appointments								
0	4 (10)	14.50 (13.40)	2	1	-	-	1	
1-2	25 (61)	17.08 (12.99)	10	1	4	5	5	
3-4	6 (15)	16.50 (11.45)	2	1	-	3	-	
≥5	6 (15)	11.00 10.47)	3	2	-	1	-	
Missing	11 (21)							

Note: Beck Depression Inventory score ranges: 0-63. [a]Beck Depression Inventory. [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression

After being asked about follow-up RDN appointments after initial consult, participants were asked if they are currently following up with a RDN. The majority of participants reported currently consulting with a RDN (n=51;71%). Mean Appraisal of Diabetes scores for those still consulting with a RDN (*M*= 20.09, *SD*= 2.84) and those who are not (*M*=18.86, *SD*= 4.24) were not significant. Mean Beck Depression Inventory scores for those still following up with a RDN (*M*= 17.41, *SD*= 11.92) and those who are not (*M*=13.23, *SD*= 12.81) were not statistically significant.

Those who answered "yes" to currently consulting with a RDN were then asked when they last met with a RDN. Beck Depression Inventory by length of time from last

RDN visit are reported in Table 23. Participants most frequently reported seeing the RDN within the past month (39%). There was no statistical significant difference for Appraisal of Diabetes score and length of time from a person's last RDN visit, however, mean Beck Depression Inventory scores were found to be statistically significant, $F(4, 23)= 4.23$, $p=.01$. A Kendall's tau test found significance among distribution of depression levels ($p=.000$). Beck Depression Inventory scores most frequently (36%) fell within depression level 1 (these ups and downs are considered normal) with the next most frequent (25%) being level 4 (moderate depression). The majority (82%) of participants who saw a RDN less than a month ago fell within depression level 1 (these ups and downs are considered normal).

Table 23

Beck Depression Inventory by Length of Time from Last RDN Visit (n=36)

Length of Time from Last RDN Visit	*n (%)*	*M (SD)*	BDI[a] Levels of Depression					
			1[b]	*2[c]*	*3[d]*	*4[e]*	*5[f]*	*6[g]*
Total	28 (78)	20.09 (2.89)	10	3	4	7	4	-
<month	11 (39)	7.91 (11.26)	9	1	-	-	1	
1-6 months	8 (29)	22.75 (6.09)	0	1	3	4	-	
7-12 months	7 (25)	22.00 (11.14)	1	1	1	2	2	
1-2 years	1 (4)	27.00 (-)	-	-	-	1	-	
3-5 years	1 (4)	32.00 (-)	-	-	-	-	1	
Missing	8 (22)							

Note: Beck Depression Inventory score ranges: 0-63. [a]Beck Depression Inventory. [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression

Participants were asked if they would prefer to follow-up more often than they currently do with a RDN. The majority reported that they would prefer to follow-up more often than they currently do (*n=41*; 80%). An independent t-test determined no significance among mean scores for Appraisal of Diabetes for those who do want to

follow-up more often (*M*= 20.27, *SD*=3.255) and those who do not (*M*=17.70, *SD*=2.87); *t*(45)=2.27, *p*=.028 or Beck Depression Inventory for those who want to follow-up more often (*M*=17.09, *SD*=11.76) and those who do not (*M*=12.56, *SD*=13.83); *t*(40)=0.99, *p*=.329. A Kendall's tau test determined no significance among distribution of Appraisal of Diabetes scores (p=.023) or Beck Depression Inventory levels (*p*=.373).

<center>Hemoglobin A1c and Glucose Readings of Participants</center>

Participants were asked several questions regarding their Hemoglobin A1c (HbA1c) readings. The majority (68%) of participants reported a goal prescription HbA1c of 5-7. Most participants (53%) reported that their last HbA1c level was between 6-7. Categories were created based the current American Diabetes Association recommendation for those with Type 2 diabetes. Participants were divided into having an HbA1c of 7 or below and above 7. Appraisal of Diabetes and Beck Depression Inventory scores by HbA1c goal are reported in Table 24 and 25. An independent sample t-test determined no significant difference in ADS scores between meeting HbA1c goal (*M*=20.02, *SD*= 3.33), or not meeting HbA1c goal (*M*=19.96, *SD*=4.53)*; t* (78)= 0.06, *p*=.07. An independent sample t-test determined no significant difference in BDI scores between meeting HbA1c goal or not; *t*(72)=0.91, *p*=.27. A Kendall's tau test confirmed no significant difference between meeting HbA1c goal or not and distribution of Appraisal of Diabetes scores (*p*=.555) or Beck Depression Inventory scores (*p*=2.11).

Table 24

HbA1c Goal and Appraisal of Diabetes Scale (*n*=80)

		ADS[a] Scores	ADS[a] Quartiles			
HbA1c	*n (%)*	*M (SD)*	1	2	3	4
Total	80 (100)		24	18	18	20
Goal Met (6-7)	52 (53)	20.02 (3.33)	13	13	14	12
Goal Not Met (7-8)	28 (28)	19.96 (4.53)	11	5	4	8

Note: Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale.

Table 25

HbA1c Goal and Beck Depression Inventory (*n*=74)

		BDI[a] Scores	BDI[a] Levels of Depression					
HbA1c	*n (%)*	*M (SD)*	*1[b]*	*2[c]*	*3[d]*	*4[e]*	*5[f]*	*6[g]*
Total	74 (100)		27	9	6	22	8	2
Goal Met (6-7)	48 (48)	18.08 (12.29)	17	4	2	17	8	-
Goal Not Met (7-8)	26 (26)	15.38 (12.13)	10	5	4	5	-	2

Note: Beck Depression Inventory score ranges: 0-63. [a]Beck Depression Inventory. [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression

Participants were asked to estimate the frequency of glucose checks that were outside of the recommended range. The options were 0-25% of the checks, 26-50% of the checks, 51-75% of the checks and 76-100% of the checks. Participant's characteristics in response to the question regarding the frequency of checks outside the recommended range and presented in Table 26. There was no significant difference found between frequency of glucose checks outside of recommended range and gender, race, employment, education, healthcare coverage, income and estimated monthly out-of-pocket expense for diabetes management. However, it is worth noting the frequency of which the checks are not inside the recommended range. Forty-four (*n*= 46%) reported that 25-50% of their checks were outside of the recommend range.

Table 26

Frequency of Glucose Readings Outside of Recommended Range by Participant Characteristics (*N*=95)

Glucose Checks Outside of Recommended Range	0-25% of checks	26-50% of checks	51-75% of checks	76-100% of checks
Total	17	44	15	5
Gender				
Male	7	23	6	2
Female	10	20	9	3
Missing		1		
Race				
Black or African American Hispanic	1	8	1	-
Black or African American Non Hispanic	1	-	-	-
Native American/Alaskan Native	-	4	1	-
White, Hispanic	3	11	2	1
White, Non-Hispanic	12	20	11	4
Missing		1		
Employment Status				
Full Time	12	16	8	3
Part Time	2	6	4	-
Retired	2	15	2	1
Disabled	-	1	-	-
Not Employed	1	5	-	1
Missing		1	1	
Education				
Less than High School	2	-	1	-
HS Diploma or equivalent	1	12	2	1
Technical Certification	2	6	4	-
Associate Degree	2	8	1	1
Bachelor Degree	6	13	4	3
Master Degree	3	4	1	-
Doctorate	1	-	1	-
Missing		1	1	
Healthcare Coverage				
Yes	14	37	13	5
No	1	3	2	-
Missing	2	4		

Income				
<$20,000	-	3	-	-
$20,000-$44,999	2	6	7	2
$45,000-$139,999	6	15	4	1
$140,000-$149,999	2	5	1	-
$150-000-$199,999	2	5	3	1
$200,000 or more	3	-	-	-
I prefer not to answer	1	8	-	1
Missing	1	2		
Monthly Out of Pocket Cost				
$0-$499	8	15	5	5
$500-$999	4	7	5	-
$1,000-$1,999	1	9	2	-
$2,000-$2,999	1	5	2	-
$3,000-$3,999	-	1	1	-
$5,000 or more	-	1	-	-
Not sure	2	4	-	-
Missing	1	2		

Note: 18 missing responses overall for glucose readings outside of recommended range.

Self-reported frequency of glucose checks outside of recommended range and Appraisal of Diabetes Scale and Beck Depression Inventory scores are reported in Table 27. A one-way ANOVA determined significance among mean scores of Appraisal of Diabetes Scale by self-reported glucose checks outside of recommended range, $F(3, 76) = 5.67, p = .001$. Turkey's HSD test for multiple comparisons found that the mean value of self-reported glucose checks was significantly different between 0-25% of glucose checks outside of recommended range and 76-100% of glucose checks outside of recommended range (p=[.001], 95% CI= -11.45,-2.17) and 26-50% of glucose checks outside of recommended range and 76-100% of glucose checks outside of recommended range (p=[.004], 95% CI= -4.24, 1.23). There was no significant difference among Beck Depression Inventory scores by self-reported glucose checks outside of recommended range, $F(3, 71) = 1.68, p = .18$.

Table 27

Self-Reported Frequency of Glucose Checks Outside of Recommended Range and Appraisal of Diabetes Scale and Beck Depression Inventory (*N*=95)

Frequency of Glucose Checks Outside of Recommended Range	ADS[a] Scores		BDI[b] Scores	
	n (%)	*M (SD)*	*n (%)*	*M (SD)*
Total	80 (100)	20.00 (3.76)	75 (93%)	16.92 (12.28)
0-25% of the time	17 (21)	18.59 (4.08)	16 (21%)	12.31 (10.08)
26-50% of the time	43 (54)	19.55 (3.11)	40 (53%)	17.30 (12.74)
51-75% of the time	15 (19)	21.07 (3.79)	14 (19%)	18.00 (11.38)
76-100% of the time	5 (6)	25.40 (2.88)	5 (7%)	25.60 (14.81)
Missing	-		6 (7%)	

Note: Beck Depression Inventory score ranges: 0-63, Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale. [b]Beck Depression Inventory.

<u>Healthcare Coverage</u>

The survey asked participants several questions regarding their health insurance coverage. They asked to report whether they currently have healthcare coverage, if their coverage currently covers a RDN consult and if whether healthcare coverage covered the cost of a RDN consult at the time of their type 2 diabetes diagnosis. Most participants reported having healthcare coverage (71%) as well as having coverage for their visit with a RDN at the time of their type 2 diabetes diagnosis (51%).

Appraisal of Diabetes Scale by having current healthcare coverage, current coverage of RDN appointments and coverage at the time of diagnosis are reported in Table 28. The majority of participants who completed the Appraisal of Diabetes reported having healthcare coverage (92%). An independent sample t-test was performed and there was no significance found between Appraisal of Diabetes Scale scores and currently having healthcare coverage, $t(74)=0.46$, $p > .05$. There was fairly even distribution of scores among quartiles. Kendall's tau test determined no significance between

distribution of Appraisal of Diabetes score and current healthcare coverage (p=.827).

Participants most frequently reported having current coverage of a RDN visit (48%).

There were 34%of participants who reported not knowing if a consult with a RDN is

currently covered by their healthcare. An ANOVA found no significance among current

coverage of a RDN visit and Appraisal of Diabetes Scale (*M*=19.96, *SD*=3.78); *F*(2,

76)=0.478, *p*=.622. There was fairly even distribution of scores within quartiles.

Kendall's tau test determined no significance between distribution of Appraisal of

Diabetes scores and current coverage of a RDN visit (p=.593). Majority of participants

(63%) reported having coverage of a RDN consult at the time of their type 2 diabetes

diagnosis. Kendall's tau test determined no significance between coverage of RDN visit

at time of type 2 diabetes diagnosis and distribution of Appraisal of Diabetes scores

(p=.066).

Table 28

Appraisal of Diabetes Scale by Current Healthcare Coverage, Coverage of RDN Services Currently and at Time of Diagnosis (*n*=80)

		ADS[a] Scores	ADS[a] Quartiles			
Criteria	*n (%)*	*M (SD)*	1	2	3	4
Total	80 (100)	20.00 (3.77)	24	18	18	20
Currently Have Healthcare Coverage						
Yes	69 (92)	20.03 (3.91)	22	14	15	18
No	6 (8)	19.83 (3.31)	1	2	2	1
Missing	5 (6)					
Does Current Healthcare coverage cover RD Consult						
Yes	38 (48)	20.16 (3.24)	11	8	11	8
No	14 (18)	20.50 (4.31)	3	3	3	5
I don't know	27 (34)	19.41 (4.24)	10	7	4	6
Missing	1 (1)					
RD Consult covered at DX						
Yes	50 (63)	20.56 (3.35)	14	7	14	15
No	10 (13)	18.70 (5.64)	3	3	2	2
I don't know	20 (25)	19.25 (3.58)	7	8	2	3

Note: Appraisal of Diabetes Scale scores can range from 5-35. [a]Appraisal of Diabetes Scale.

Beck Depression Inventory by current healthcare coverage, coverage of RDN services now and at time of diagnosis are reported in Table 29. The majority of participants who completed the Beck Depression Inventory reported having healthcare coverage (91%). Participants with coverage most frequently fell within category 1 (these ups and downs are considered normal) (36%) with the next most frequent being level 4 (moderate depression) (30%). An independent t-test was performed and there was no significance found between Beck Depression Inventory Scale scores and currently having healthcare coverage, $t(69)=0.94$, $p >.05$. A Kendall's tau test found no statistically significant difference between distribution of Beck Depression Inventory scores and current healthcare coverage ($p=.706$).

Forty-seven percent of participants reported having current coverage of a RDN visit while 36% reported not knowing if they have current coverage. Those who have current coverage most frequently fell within depression level 4 (moderate depression) (38%) while those who do not know about current coverage most frequently fell within depression level 1 (these ups and downs are considered normal) (54%). An ANOVA found no significance among current coverage of a RDN visit and Beck Depression Inventory (M=16.97, SD=12.22); $F(2, 70)$=2.29, p=.109. A Kendall's tau test found no statistically significant difference between Beck Depression Inventory scores and current coverage of a RDN visit (p=.177).

The majority of participants reported having coverage of a RDN consult at the time of their diabetes diagnosis (61%). A Kendall's tau test found no statistically significant difference in the distribution between distribution of Beck Depression Inventory scores and coverage of RDN at time of type 2 diabetes diagnosis (p=.636).

Table 29

Beck Depression Inventory by Current Healthcare Coverage, Coverage of RDN Services Currently and at Time of Diagnosis (*n*=74)

		BDI[a] Scores	BDI[a] Levels of Depression					
Characteristic	*n (%)*	*M (SD)*	*1[b]*	*2[c]*	*3[d]*	*4[e]*	*5[f]*	*6[g]*
Total	70 (95)	20.01 (3.85)	25	9	6	21	7	2
Current Healthcare Coverage								
Yes	64 (91)	17.06 (11.97)	23	9	5	19	6	2
No	6 (9)	17.17 (12.77)	2	-	1	2	1	-
Missing	4 (5)							
Current Healthcare coverage cover RDN Consult								
Total	73 (99)	16.97 (12.22)	27	9	6	21	8	2
Yes	34 (47)	17.24 (10.32)	10	4	4	13	3	-
No	13 (18)	22.54 (13.59)	3	1	1	4	4	-
I don't know	26 (36)	13.85 (13.21)	14	4	1	4	1	2
Missing	1 (1)							
RDN Consult covered at Diagnosis								
Total	74 (100)	17.14 (12.22)	27	9	6	22	8	2
Yes	45 (61)	17.36 (11.11)	15	5	4	16	5	-
No	9 (12)	17.33 (15.26)	4	-	1	2	2	-
I don't know	20 (27)	16.55 (13.76)	8	4	1	4	1	2

Note: Scores for Beck Depression Inventory scores range: 0-63. [a]Beck Depression Inventory. [a]Beck Depression Inventory. [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression

<u>Household Income and Diabetes Management Expenses</u>

Participants were asked to report their yearly income and estimated out-of-pocket cost for their diabetes management. The most frequently reported yearly household income was $45,00-$139,999 (32%) followed by $20,00-$44,999 (17%). The most frequently reported estimated monthly out-of-pocket cost of diabetes management was $0-$499 (34%).

Appraisal of Diabetes Scale by household income and estimated out-of-pocket cost for diabetes management is reported in Table 30. Distribution among quartiles was fairly even. A Kendall's tau test determined no significance among distribution of

Appraisal of Diabetes Scale scores and household income (p=.497). An ANOVA found

no significance among household income and Appraisal of Diabetes Scale scores

(*M*=20.04, *SD*=3.80); *F*(6, 71)=1.55, *p*=.175. Appraisal of Diabetes Scale by Monthly

Out-of-Pocket Cost of Diabetes Management are reported in Table 30. Scores among

quartiles were fairly evenly distributed. A Kendall's tau test determined no significance

of distribution for Appraisal of Diabetes scores and Monthly Out-of-Pocket Cost of

Diabetes Management (*p*=.020).

Table 30

Appraisal of Diabetes Scale by Household Income and Monthly Out of Pocket
Expenditures on Diabetes Management (*n*=80)

Criteria	n (%)	M (SD)	ADS[a] Quartile			
			1	2	3	4
Total	80 (100)	19.99 (3.75)	24	18	18	20
Household Income						
<$20,000	3 (4%)	17.00 (1.73)	3	-	-	-
$20,000-$44,999	17 (22%)	21.24 (4.18)	3	3	5	6
$45,000-$139,999	26 (33%)	19.42 (4.01)	8	5	7	6
$140,000-$149,999	8 (10%)	20.63 (3.89)	3	-	2	3
$150,000-$199,999	11 (14%)	21.82 (3.57)	2	1	3	5
$200,000 or more	3 (4%)	18.33 (1.15)	1	2	-	-
I prefer not to answer	10 (13%)	18.60 (2.59)	3	6	1	-
Missing	2 (2%)					
Monthly OOP[b] Cost DM[c]						
$0-$499	33 (42)	19.06 (4.83)	16	7	2	8
$500-$999	16 (21)	20.25 (2.79)	4	3	5	4
$1,000-$1,999	12 (15)	21.08 (2.07)	1	3	5	3
$2,000-$2,999	8 (10)	22.63 (1.77)	-	-	5	3
$3,000-$3,999	2 (3)	19.50 (2.12)	1	-	1	-
$4,000-$4,999	-	--	-	-	-	-
$5,000 or more	1 (1)	20.00 (-)	-	1	-	-
I am not sure	6 (8)	19.50 (3.89)	1	3	-	2
Missing	2 (2)					

Note: Appraisal of Diabetes Scale score range: 5-35. [a]Appraisal of Diabetes Scale. [b]Out-of-Pocket. [c]Diabetes Management

Beck Depression Inventory by household income and estimated out-of-pocket

estimated expenditures for diabetes management is reported in Table 31. Participants

with reported income of $45,000-$139,999 most frequently had scores indicating

moderate depression (36%) followed by these ups and downs are considered normal

(32%). Those with reported income of $20,000-$44,999 and $150,000-$199,999 also had

scores most frequently indicate moderate depression. A Kendall's tau test determined no

significance among distribution of Beck Depression Inventory depression levels and

household income ($p=.045$). Additionally, a Kendall's tau test determined no significance

of distribution for Beck Depression Inventory scores and monthly out-of-pocket cost of

diabetes management ($p=.076$).

Table 31

Beck Depression Inventory by Household Income and Monthly Out-of-Pocket Expenditures for Diabetes Management (*n*=74)

	n (%)	*M (SD)*	*1*[b]	*2*[c]	*3*[d]	*4*[e]	*5*[f]	*6*[g]
			over BDI[a] Levels of Depression					
Total	74(100)	16.92 (12.28)	27	9	6	22	8	2
Household Income								
<$20,000	3 (4)	12.33 (1.15)	-	3	-	-	-	-
$20,000-$44,999	17 (24)	22.24 (12.57)	4	1	2	6	3	1
$45,000-$139,999	25 (35)	18.28 (11.68)	8	2	3	9	3	-
$140,000-$149,999	6 (8)	13.17 (14.44)	3	1	-	1	1	-
$150,000-$199,999	9 (13)	18.56 (9.96)	2	1	1	4	1	-
$200,000 or more	3 (4)	4.33 (4.04)	3	-	-	-	-	-
I prefer not to answer	9 (13)	11.67 (14.15)	6	1	-	1	-	1
Missing	2 (3)							
Monthly OOP[b] Cost DM[c]								
$0-$499	32 (44)	19.06 (4.83)	16	4	1	8	1	2
$500-$999	15 (21)	20.25 (2.79)	5	1	3	5	1	-
$1,000-$1,999	12 (17)	21.08 (2.07)	1	3	1	3	4	-
$2,000-$2,999	5 (7)	22.63 (1.77)	-	-	-	3	2	-
$3,000-$3,999	1 (1)	19.50 (2.12)	1	-	-	-	-	-
$4,000-$4,999	-	--	-	-	-	-	-	-
$5,000 or more	1 (1)	20.00 (-)	1	-	-	-	-	-
I am not sure	6 (8)	19.50 (3.89)	2	1	1	2	-	-
Missing	2 (2)							

Note: Beck Depression Inventory score ranges: 0-63. [a]Beck Depression Inventory. [b]These ups and downs are considered normal; [c]Mild mood disturbance; [d]Borderline clinical depression; [e]Moderate depression; [f]Severe depression; [g]Extreme depression

CHAPTER 5

DISCUSSION AND CONCLUSION

<u>Appraisal of Diabetes Scale and Beck Depression Inventory</u>

The average participant of this study had a Beck Depression Inventory score of 17 out of a possible range of 0-63. The average participant also had an Appraisal of Diabetes Scale score of 20 out of a possible range of 5-35. There was a strong, positive correlation found between diabetes related quality-of-life and depressive symptoms, quality-of-life decreased as depressive symptoms increased.

This study found a positive correlation between both Appraisal of Diabetes and Beck Depression Inventory scores and sum of comorbidities experienced with diabetes. As the number of comorbidities increased their Appraisal of Diabetes and Beck Depression Inventory scores increase indicated a lower diabetes related quality-of-life and more depressive symptoms.

Survey results found Beck Depression Inventory scores to be significantly different between genders. Females had greater depressive symptoms when compared to males. This aligns with a previous study finding that in those with diabetes, women typically had more depressive symptoms than men (Gois et al., 2018). However more studies are needed to confirm this finding before being able to generalize to a larger population.

The majority of participants in this study reported an HbA1c between 6 and 7, meeting the goal HbA1c. There was no statistical significance between those who met or did not meet the goal and depression and quality-of-life scores. However Beck Depression Inventory scores for those who met the HbA1c goal also had a similar number of participants in both normal and moderate depression categories Those participants who did not meet the HbA1c goal most frequently scored within the normal Beck Depression Inventory.

This study also found an association between the frequency of glucose checks outside of a person's recommended range and quality-of-life scores. There were 46% of participants who reported having out of range glucose checks 25-50% of the time. Those who had poor glucose control had lessened quality-of-life. While the study did not find Beck Depression Inventory and poor glucose control significant, the correlation found between diabetes related quality-of-life and depressive symptoms can be applied here. As a person's glucose became more out of control and they reported a lower quality-of-life and were more likely to have an increase in depressive symptoms. These findings suggest that for those who assisted in diabetes management such as RDNs, they are improving diabetes related quality-of-life and potentially depressive symptoms. Research has previously found that an increase in blood glucose self-monitoring frequency as well as improved blood glucose levels correlated with RDN education sessions (Lemon et al., 2004). This supports the importance of RDN's in assisting those with diabetes maintain glycemic control in turn have a positive effect on both their diabetes related quality-of-life and depressive symptoms.

RDN Consultation

Results suggest improved quality-of-life for a person with type 2 diabetes when a physician recommended a person with newly diagnosed type 2 diabetes see a RDN for education and counseling soon after diagnosis. As length of time from diagnosis to a RDN consult recommendation increased, so did Beck Depression scores, indicating a higher level of depression. Participants who received a recommendation within 0-4 weeks of diagnosis had 71% of scores within a normal level of depression. The recommendation by the American Diabetes Association and Academy of Nutrition and Dietetics that all people diagnosed type 2 diabetes should receive medical nutrition therapy as it is an important piece of disease management is supported by this finding. Findings that quality-of-life are improved after seeing a RDN for type 2 diabetes management is consistent with another study findings on MNT's impact on quality-of-life improvement (Early & Stanley, 2018).

This study found that not all physicians were recommending people with newly diagnosed Type 2 Diabetes right away. Sixty-three of participants did not receive a RDN consult recommendation within 4 weeks of their type 2 diabetes diagnosis. Location of a RDN and referral after type 2 diabetes diagnosis were not found to deter consultation with an RDN. Most participants reported being recommended to see a RDN regardless of distance, though most were within 30 miles of a RDN.

Healthcare coverage for a RDN visit and length after diagnosis for RDN consult recommendation was not significant. There were however 53% of participants who had insurance coverage for a RDN visit at time of diagnosis and only 36% of participants reported seeing a RDN within the first few months after their type 2 diabetes diagnosis. There were 15 participants who indicated having healthcare coverage at time of diagnosis

but waited 1-6 months before seeing a RDN and nine who waited six or more months before seeing a RDN. Those who were unsure of their coverage of a RDN consult most frequently had Beck Depression Inventory scores fall within the moderate depression category. RDNs can utilize this information to help address the barrier of not having insurance coverage for RDN services. It is important for providers and patients to have a good understanding of their insurance coverage at time of diagnosis to be able to provide the best care possible as well as ensure all resources are properly utilized.

Beck Depression Inventory scores were more likely to fall within the normal range for those who were satisfied with the time it took to be seen by a RDN after initial referral. Participants were asked if they felt the RDN helped them with their diabetes management and the majority reported the RDN helped. There was no statistically significant difference in reported depressive symptoms for those assisted by the RDN, however, the mean Beck Depression Inventory scores were lower for those who felt the RDN assisted with diabetes management. This could potentially be related to the quality of instruction received by participants. It would also be important to determine whether these people received education in a group setting or one-on-one.

Race and length of time from diagnosis and RDN consult recommendation was not significant but there were differences in percentages of those given a RDN consult recommendation right away. Only 13% of participants who identified as Black or African American Hispanic were referred to a RDN within the first month after their type 2 diabetes diagnoses versus 40% of White, Non-Hispanic and 42% White, Hispanic participants who were recommended in the first month after their diagnosis. It is also important to note that the majority of participants in this study identified as White, Non-

Hispanic which is not representative of the majority of the population who have type 2 diabetes. Other studies are needed to support these findings and to be able to generalize findings to the type 2 diabetes population.

There was no significance differences found among Appraisal of Diabetes scores or Beck Depression Inventory scores and those currently seeing a RDN or not for follow-up. Appraisal of Diabetes scores for those still consulting with a RDN were higher indicating those not being followed by an RDN currently have better quality-of-life related to their diabetes. This could indicate a lack of confidence in participants reported on the Appraisal of Diabetes Scale questions within the survey. On most questions, participants seeing the RDN currently for follow-up most frequently indicated having moderate feelings about what they were being asked to report on related to their diabetes quality-of-life. More information regarding confidence gained from seeing a RDN may be needed to determine significance of continued follow-up.

While the number of follow-up visits with the RDN was not significant those with more follow-ups reported a higher quality-of-life and Beck Depression Inventory scores. Those who indicated having seen the RDN less than a month ago more frequently fell within a normal level of depression. These findings support the Academy of Nutrition and Dietetics recommendation to have continued follow-up with a RDN throughout the duration of a person's diabetes diagnosis (Early & Stanly, 2018). Continued RDN follow-up has the potential to assist in increasing diabetes related quality-of-life as well as reduce depressive symptoms.

<u>Limitations</u>

There were several limitations of this study. Not all participants completed the survey in full which limited the number of scores available for analysis for both Appraisal of Diabetes Scale and Beck Depression Inventory. When looking at location within the US, the number of participants in each region was too small of a sample size to use for an analysis to determine any significance. From this study a relationship between location and length of time after diagnosis before seeing a RDN was not able to be determined. Larger studies will need to be completed to potentially draw conclusions on location and links to depression and quality-of-life for people with type 2 diabetes.

Participants were also not asked about the length of their type 2 diabetes diagnosis. In knowing how long a person has been managing type 2 diabetes some additional significance and relationships could have potentially been made. It could also help to gain a better understanding of where people are in their disease management journey.

This study did not specify if group versus individual RDN education was received by the participants. This would be a question to investigate in future studies. Another limitation is that it was not asked if people received the gold standard of care, use of a multi-disciplinary team. They were only asked whether they saw a RDN. The RDN could have been part of a team Asking about multi-disciplinary care could have revealed potential significance. Future studies should investigate this further and clarify RDN from an entire multi-disciplinary team.

This study did not ask about the impact of COVID-19 on a person's depressive symptoms and their diabetes management. It is possible the depressive symptoms being experienced by participants were partially related to COVID-19 and the effect COVID-19

had on their diabetes management. It would also be desirable to have a larger sample size in future studies as well to potentially be able to generalize findings to a larger population of those with Type 2 Diabetes.

Summary

The results of this study indicate providing a consult recommendation for a Registered Dietitian Nutritionist soon after a type 2 diabetes diagnosis is important to assisting with improving quality-of-life in those with diabetes. Faster referrals following diagnosis by medical doctors determining any barriers preventing completion of a RDN recommendation are key to achieving better results in diabetes management. Results of this study can help Registered Dietitian's be aware of certain characteristics that might put their patients at higher risk for more depressive symptoms or lower quality-of-life as it relates to their type 2 diabetes. Those who have less glucose control and gender are factors to consider when responding to depression and quality-of-life concerns. RDN's may consider routinely screening for depressive symptoms and quality-of-life and making appropriate referrals as needed.

APPENDIX A

A-1 DATA COLLECTION INSTRUMENT

A-2 BECK DEPRESSION INVENTORY SCORING TOOL

A-3 APPRAISAL OF DIABETES SCALE SCORING TOOL

A-1 Data Collection Instrument

Quality-of-Life in Persons with Type 2 Diabetes Mellitus who also have Depression as Defined by the Beck Depression Inventory

PURPOSE OF STUDY/PROJECT: The purpose of this study is to assess whether self-reported symptoms of depression, glycemic control, and intervention by an RDN have an impact on the quality-of-life in persons diagnosed with type 2 diabetes mellitus and compare the quality-of-life scores in those with type 2 diabetes who have received MNT with those who have not.

PROCEDURE: A survey link will be distributed via email and social media accounts. Prior to being able to access the survey link, participants must agree to participate by selecting "yes" indicating that they are willing to participate. The survey will ask participants to answer questions related to demographics and nutrition in the context of type 2 diabetes. The participants will also complete the Appraisal of Diabetes Scale and Beck Depression Inventory in order to evaluate quality-of-life as it relates to type 2 diabetes and level of depression, respectively. Demographic questions and questions related to nutrition information will be tabulated. The answers to the Appraisal of Diabetes Scale and Beck Depression Inventory answers will be scored and categorized accordingly. These answers will then be used to evaluate the hypotheses.

INSTRUMENTS: Online Evaluation of Depression and Quality-of-Life in Persons with Type 2 Diabetes Mellitus Survey

RISKS/ALTERNATIVE TREATMENTS: I understand this is a descriptive study therefore there is no predicted risk. Should I wish to withdraw from the survey early, I can do so by exiting the website.

BENEFITS/COMPENSATION: I have read and understood the following description of the study, "Quality-of-life in persons with type 2 diabetes mellitus who also have depression as defined by the Beck Depression Inventory" and the research purpose and methods. I understand that my participation in this research study is strictly voluntary. My participation or refusal to participate in this study will not affect my relationship with Louisiana Tech University. Further, I understand I may withdraw at any time to answer any questions without penalty. I understand that results of my survey will be confidential and available only to the principal investigators. I have not been requested to waive nor do I waive any of my rights related to participating in this study. I am over 18 years of age and have a preexisting diagnosis of type 2 diabetes.

Q1 You are being asked to complete a survey as part of a research study. The purpose of this study is to assess whether self-reported symptoms of depression,

glycemic control, and intervention by a Registered Dietitian Nutritionist (RDN) have an impact on the quality-of-life in persons diagnosed with type 2 diabetes mellitus and compare the quality-of-life scores in those with type 2 diabetes who have received medical nutrition therapy (MNT) with those who have not. This survey will take approximately 10-15 minutes to complete. You will be asked questions related to demographics and nutrition in the context of type 2 diabetes. You will also complete the Appraisal of Diabetes Scale and Beck Depression Inventory Scale. This is a descriptive study and therefore has no predicted risk. Should you wish to withdraw from the survey early, you may do so by exiting the website. In selecting "I agree to participate in the study" below, you agree to the following. I have read and understood the description of the study and the research purpose and methods. I understand that my participation in this research study is strictly voluntary. My participation or refusal to participate in this study will not affect my relationship with Louisiana Tech University. Further, I understand I may withdraw at any time without penalty. I understand that results of my survey will be confidential and available only to the principal investigators. I have not been requested to waive nor do I waive any of my rights related to participating in this study.

○ I agree to participate in the study (1)

○ I do not agree (2)

Skip To: End of Survey If Q1 = I do not agree

- -

Page Break ————————————————————————————————

Q2 I am 18 years of age or older

○ Yes (1)

○ No (2)

Skip To: End of Survey If Q2 = No

- -

Q3 I have a diagnosis of type 2 diabetes

○ Yes (2)

○ No (3)

Skip To: End of Survey If Q3 = No

- -

Q4 I reside within the United States

○ Yes (1)

○ No (2)

Q5 What is your gender?

○ Male (1)

○ Female (2)

○ Transgender (4)

○ Other (5) _____

○ Do not wish to reply (6)

Q6 What is your age?

○ Please enter your age. (6) _____
Q7 What is the highest level of education you have attained?

○ Less than high school completion (4)

○ High School Diploma or equivalent (1)

○ Technical Certification (8)

○ Associate's Degree (2)

○ Bachelors's Degree (3)

○ Master's Degree (6)

○ Doctoral Degree (7)

Q8 What area of the United States do you currently live in?

○ New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island or Vermont) (1)

○ Mid-Atlantic (Delaware, Maryland, New Jersey, New York, Pennsylvania or Washington D.C.) (2)

○ Midwest (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebreska, North Dakota, Ohio, South Dakota or Wisconsin) (3)

○ South (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, or West Virginia) (4)

○ Southwest (Arizona, New Mexico, Oklahoma or Texas) (5)

○ West (Alaska, Colorado, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington or Wyoming) (6)

- -

Q9 What is your race?

○ Asian (3)

○ Black or African American Hispanic (1)

○ Black or African American Non-Hispanic (2)

○ American Indian or Alaskan Native (4)

○ Native Hawaiian or other Pacific Islander (5)

○ White Hispanic (6)

○ White Non-Hispanic (7)

○ Multi-racial, please list (8) _____

○ Other, please list (9) _____

- -

Q10 What is your employment status?

○ Employed; Full-Time (working 32 or more hours weekly) (1)

○ Employed; Part-Time (working less than 32 hours weekly) (2)

○ Retired (4)

○ Disabled (5)

○ Not Employed (3)

Q11 Please check all of the diagnosed medical conditions or symptoms you are experiencing.

☐ Hypertension or high blood pressure (1)

☐ Overweight or obesity (2)

☐ Chronic heart disease (3)

☐ Chronic kidney disease (6)

☐ Peripheral vascular disease (poor circulation to feet and/or fingers) (7)

☐ Foot ulcers (8)

☐ Worsening eyesight related to a chronic disease and not age (9)

☐ Gastrointestinal upset (10)

☐ Tingling of the hands and/or feet (11)

☐ Other(s) (12) _____

Q12 Has a physician or medical professional ever recommended you see a Registered Dietitian Nutritionist for diabetes management?

○ Yes (1)

○ No (2)

Q13 Have you ever seen a Registered Dietitian Nutritionist for diabetes management?

○ Yes (1)

○ No (2)

Q14
How long after being diagnosed were you told to see a Registered Dietitian Nutritionist for nutrition outpatient education/counseling?

○ 0-4 weeks (1)

○ 1-6 months (2)

○ 6+months (3)

○ I was never told to see a dietitian for nutrition education/ counseling (4)

○ I only saw a dietitian in the hospital (5)

Q15 Did you see the Registered Dietitian Nutritionist in person or on telehealth? Telehealth is when you see your medical provider remotely through either a

computer, phone or other electronic device. It may also be an appointment through a telephone call.

○ In person (1)

○ Telehealth (2)

○ Both (4)

Q16 Were you satisfied with the time it took you to get an appointment and be seen by a Registered Dietitian Nutritionist after being referred?

○ Yes (1)

○ No (3)

○ I was not referred (4)

○ I sought out a dietitian on my own (5)

Q17 How long did you spend with a Registered Dietitian Nutritionist during your first visit?

○ Less than 30 minutes (1)

○ 30 minutes (2)

○ 45 minutes (3)

○ 60 minutes (4)

○ Greater than 60 minutes (5)

Q18 Did a Registered Dietitian Nutritionist recommend diet changes during your initial visit?

○ Yes (1)

○ No (2)

Q19 If changes were recommended, how many changes were you able to make to your diet?

○ 0% - No changes were made (1)

○ 25% - Minimal changes were made (2)

○ 50% - Moderate changes were made (3)

○ 75% - Significant changes were made (4)

○ 100% - I have a completely different diet now (5)

Q20 Did you and the Registered Dietitian Nutritionist decide on these changes together?

○ Yes (1)

○ No (2)

Q21 Do you feel the Registered Dietitian Nutritionist helped you improve your diabetes management? Please tell us why you chose either yes or no.

○ Yes (1) _____

○ No (2) _____

Q22 After your initial meeting with a Registered Dietitian Nutritionist, how many follow up appointments did you complete?

○ 0 (1)

○ 1 (2)

○ 2 (3)

○ 3 (4)

○ 4 (5)

○ 5 or more follow ups (6)

Q23 Currently, do you still follow up with a Registered Dietitian Nutritionist?

○ Yes (1)

○ No (7)

Q24 When was the last time you saw a Registered Dietitian Nutritionist for your diabetes?

○ Less than a month ago (1)

○ 1-6 months ago (2)

○ 7-12 months ago (3)

○ 1-2 years ago (4)

○ 3-5 years ago (5)

○ More than 5 years ago (6)

Q25 Would you prefer to follow up with a Registered Dietitian Nutritionist more often than you do?

○ Yes (1)

○ No (3)

Q26 Why don't you follow up more often with a Registered Dietitian Nutritionist?

○ Cost (1)

○ Insurance does not coverage (2)

○ They are located too far away (3)

○ I do not have time (4)

○ Other (5) _____

Q27 How far away was the Registered Dietitian Nutritionist located from your residence?

○ Less than 10 miles (1)

○ 10-20 miles (2)

○ 21-30 miles (3)

○ 31-40 miles (4)

○ 41-50 miles (5)

○ Greater than 50 miles (6)

○ I do not know (7)

Q28 Do you ever directly contact a Registered Dietitian Nutritionist if you have questions regarding your diet or diabetes management in between appointments?

○ Yes (1)

○ No (3)

○ I only had one visit (4)

Q29 Do you have healthcare coverage?

○ Yes (1)

○ No (2)

Q30 Did your health insurance cover a consult with a Registered Dietitian Nutritionist when you **were diagnosed** with diabetes?

○ Yes (1)

○ No (3)

○ I do not know if it was covered (4)

Q31 Does your insurance **currently** cover a consult with a Registered Dietitian Nutritionist?

○ Yes (1)

○ No (2)

○ I do not know if it is covered (3)

Q32 What is your goal prescription by your doctor for your Hemoglobin A1c (HbA1c) ?

○ Hemoglobin A1c: 4-4.99 (4)

○ Hemoglobin A1c: 5-5.99 (5)

○ Hemoglobin A1c: 6-7 (6)

○ Hemoglobin A1c: greater than 7 (7)

○ I do not know (8)

○ I have glucose readings as a goal (9)

Q33 What was your last Hemoglobin A1c (HbA1c) level?

○ HbA1c 4-4.99 (4)

○ HbA1c 5-5.99 (5)

○ HbA1c 6-7 (6)

○ HbA1c greater than 7 (7)

○ I do not know (8)

Q34 What is your recommended glucose range for individual readings?

_____

Q35 How often are your individual glucose checks outside of your recommended range?

○ 0-25% of the time- very rarely (1)

○ 26-50% of the time- rarely (2)

○ 51-75% of the time- often (3)

○ 76-100% of the time- very often (4)

Q36 Below is a list of activities you have to perform to manage your diabetes. Please read each one and then select the number which best describes how confident you usually are that you could carry out that activity. For example, if you are completely confident that you are able to check your blood sugar levels when necessary, select 10- Certain I can do. If you feel that most of the time you could not do it, select 0- Cannot Do At All

	Can't Do At All (0) (1)	1 (42)	2 (32)	3 (33)	4 (34)	Maybe (5) (35)	6 (36)	7 (37)	8 (38)	9 (39)	Certain I Can Do (10) (40)
I am able to check my blood sugar if necessary (4)	○	○	○	○	○	○	○	○	○	○	○
I am able to correct my blood sugar when the sugar level is too high (5)	○	○	○	○	○	○	○	○	○	○	○
I am able to correct my blood sugar when the	○	○	○	○	○	○	○	○	○	○	○

blood
sugar
level is
too low
(6)

I am able
to choose   C   C   C   C   C   O   C   C   C   C   O
the
correct
foods (7)

I am able
to keep   C   C   C   C   C   O   C   C   C   C   O
my
weight
under
control
(8)

I am able
to   C   C   C   C   C   O   C   C   C   C   O
examine
my feet
for cuts
(9)

I am able
to adjust   C   C   C   C   C   O   C   C   C   C   O
my eating
plan
when ill
(10)

I am able
to follow   C   C   C   C   C   O   C   C   C   C   O
a healthy
eating
pattern
most of
the time
(11)

I am able
to take   C   C   C   C   C   O   C   C   C   C   O
more
exercise if
the
doctor
advises

me to (12)

When taking more exercise I am able to adjust my eating plan (13)	○	○	○	○	○	○	○	○	○	○	○
I am able to follow a healthy eating pattern when I am away from home (14)	○	○	○	○	○	○	○	○	○	○	○
I am able to follow a healthy eating pattern when I am eating out or at a party (15)	○	○	○	○	○	○	○	○	○	○	○
I am able to adjust my eating plan when I am feeling stressed or anxious (16)	○	○	○	○	○	○	○	○	○	○	○
I am able to take my medicatio	○	○	○	○	○	○	○	○	○	○	○

n as prescribed (17)

I am able to adjust my medication when I am ill (18)

  C   C   C   C   C   O   C   C   C   C   O

Q37 People differ in their thoughts and feelings about having diabetes. We would like to know how you feel about having diabetes. Therefore, please select the answer to each question which is closest to the way you feel. Please give your honest feelings– we are interested in how you feel, not what your doctor or family may think.

How upsetting is having diabetes for you? (1)	○ Not at All (1)	○ Slightly Upsetting (2)	○ Moderately Upsetting (3)	○ Very Upsetting (4)	○ Extremely Upsetting (5)
How much control over your diabetes do you have? (2)	○ None at All (1)	○ Slight Amount (2)	○ Moderate Amount (3)	○ Large Amount (4)	○ Total Amount (5)
How much uncertainty do you currently experience in your life as a	○ None at All (1)	○ Slight Amount (2)	○ Moderate Amount (3)	○ Large Amount (4)	○ Extremely Large Amount (5)

91

result of being diabetic? (3)

How likely is your diabetes to worsen over the next several years? (Try to give an estimate based on your personal feeling rather than based on a rational judgment.) (8)

○ Not Likely at All (1)　○ Slightly Likely (2)　○ Moderately Likely (3)　○ Very Likely (4)　○ Extremely Likely (5)

Do you believe that achieving good diabetic control is due to your efforts as compared to factors which are beyond your

○ Totally because of me (1)　○ Mostly because of me (2)　○ Partly because of me and partly because of other factors (3)　○ Mostly because of other factors (4)　○ Totally because of other factors (5)

control? (9)				
How effective are you in coping with your diabetes ? (11)	○ Not at All (1)	○ Slightly Effective (2)	○ Moderately Effective (3)	○ Very Effective (4)	○ Extremely Effective (5)
To what degree does your diabetes get in the way of your developing life goals? (10)	○ Not at All (1)	○ Slight Amount (2)	○ Moderate Amount (3)	○ Large Amount (4)	○ Extremely Large Amount (5)

Q38 Please select the statement below that describes you best in the **last week.**

○ I do not feel sad (1)

○ I feel sad (2)

○ I am sad all the time and I can't snap out of it (3)

○ I am so sad and unhappy that I can't stand it (4)

Q39 Please select the statement below that describes you best in the **last week**.

○ I am not particularly discouraged about the future (1)

○ I feel discouraged about the future (2)

○ I feel I have nothing to look forward to (3)

○ I feel the future is hopeless and that things cannot improve (4)

Q40 Please select the statement below that describes you best in the **last week.**

○ I do not feel like a failure (1)

○ I feel I have failed more than the average person (2)

○ As I look back on my life, all I can see is a lot of failures (3)

○ I feel I am a complete failure as a person   (4)

Q41 Please select the statement below that describes you best in the **last week**.

○ I get as much satisfaction out of things as I used to (1)

○ I don't enjoy things the way I used to (2)

○ I don't get real satisfaction out of anything anymore (3)

○ I am dissatisfied or bored with everything   (4)

Q42 Please select the statement below that describes you best in the **last week**.

○ I don't feel particularly guilty (1)

○ I feel guilty a good part of the time (2)

○ I feel quite guilty most of the time (3)

○ I feel guilty all of the time   (4)

Q43 Please select the statement below that describes you best in the **last week.**

○ I don't feel I am being punished (1)

○ I feel I may be punished (2)

○ I expect to be punished (3)

○ I feel I am being punished   (4)

Q44 Please select the statement below that describes you best in the **last week**.

○ I don't feel disappointed in myself (1)

○ I am disappointed in myself (2)

○ I am disgusted with myself (3)

○ I hate myself   (4)

Q45 Please select the statement below that describes you best in the **last week**.

○ I don't feel I am any worse than anybody else (1)

○ I am critical of myself for my weaknesses or mistakes (2)

○ I blame myself all the time for my faults (3)

○ I blame myself for everything bad that happens   (4)

Q46 Please select the statement below that describes you best in the **last week.**

○ I don't have any thoughts of killing myself (1)

○ I have thoughts of killing myself, but I would not carry them out (2)

○ I would like to kill myself (3)

○ I would kill myself if I had the chance   (4)

Q47 Please select the statement below that describes you best in the **last week**.

○ I don't cry any more than usual (1)

○ I cry more now than I used to (2)

○ I cry all the time now (3)

○ I used to be able to cry, but now I can't cry even though I want to   (4)

Q48 Please select the statement below that describes you best in the **last week**.

○ I am no more irritated by things than I ever was (1)

○ I am slightly more irritated now than usual (2)

○ I am quite annoyed or irritated a good deal of the time (3)

○ I feel irritated all the time (4)

Q49 Please select the statement below that describes you best in the **last week**.

○ I have not lost interest in other people (1)

○ I am less interested in other people than I used to be (2)

○ I have lost most of my interest in other people (3)

○ I have lost all of my interest in other people   (4)

Q50 Please select the statement below that describes you best in the **last week**.

○ I make decisions about as well as I ever could (1)

○ I put off making decisions more than I used to (2)

○ I have greater difficulty in making decisions more than I used to (3)

○ I can't make decisions at all anymore   (4)

Q51 Please select the statement below that describes you best in the **last week.**

○ I don't feel that I look any worse than I used to (1)

○ I am worried that I am looking old or unattractive (2)

○ I feel there are permanent changes in my appearance that make me look unattractive (3)

○ I believe that I look ugly (4)

Q52 Please select the statement below that describes you best in the **last week.**

○ I can work about as well as before (1)

○ It takes an extra effort to get started at doing something (2)

○ I have to push myself very hard to do anything (3)

○ I can't do any work at all   (4)

Q53 Please select the statement below that describes you best in the **last week**.

○ I can sleep as well as usual (1)

○ I don't sleep as well as I used to (2)

○ I wake up 1-2 hours earlier than usual and find it hard to get back to sleep (3)

○ I wake up several hours earlier than I used to and cannot get back to sleep (4)

Q54 Please select the statement below that describes you best in the **last week.**

○ I don't get more tired than usual (1)

○ I get tired more easily than I used to (2)

○ I get tired from doing almost anything (3)

○ I am too tired to do anything   (4)

Q55 Please select the statement below that describes you best in the **last week.**

○ My appetite is no worse than usual (1)

○ My appetite is not as good as it used to be (2)

○ My appetite is much worse now (3)

○ I have no appetite at all anymore   (4)

Q56 Please select the statement below that describes you best in the **last week.**

○ I haven't lost much weight, if any, lately (1)

○ I have lost more than five pounds (2)

○ I have lost more than ten pounds (3)

○ I have lost more than fifteen pounds   (4)

Q57 Please select the statement below that describes you best in the **last week.**

○ I am no more worried about my health than usual (1)

○ I am worried about physical problems like aches, pains, upset stomach, or constipation (2)

○ I am very worried about physical problems and it's hard to think of much else (4)

○ I am so worried about my physical problems that I cannot think of anything else (5)

Q58 Please select the statement below that describes you best in the **last week.**

○ I have not noticed any recent change in my interest in sex (1)

○ I am less interested in sex than I used to be (2)

○ I have almost no interest in sex (3)

○ I have lost interest in sex completely (4)

Page Break

Q59 What is your household's yearly income level?

○ Less than $20,00 (1)

○ $20,00 - $44,999 (2)

○ $45,000- $139,999 (3)

○ $140,00-$149,999 (4)

○ $150,000- $199,999 (5)

○ $200,000 or more (6)

○ I prefer not to answer (8)

Q60 What is your estimated monthly out-of-pocket expense for diabetes management?

○ $0-$499 (1)

○ $500-$999 (2)

○ $1,000-$1,999 (3)

○ $2,000-$2,999 (4)

○ $3,000-$3,999 (6)

○ $4,000-$4,999 (7)

○ $5,000 or more (8)

○ I am not sure (5)

End of Block: Default Question Block

Start of Block: Block 1

Q61 **Thank you for your complete participation in this survey. You are now eligible to be entered into a raffle for a $25 Amazon gift card. If you would like to be entered into the raffle, please email your contact information including full name and email address, to thesisprojectnutrition@gmail.com. The winner will be contacted after the survey closes. Your information will not be linked to any answers from this survey and your responses will remain anonymous.**

A-2 Beck Depression Inventory Scoring Tool

BECK DEPRESSION INVENTORY SELF-SCORING/INTERPRETATION

Add up the score for each of the twenty-one questions, questions 22 through 42 on the survey, by counting the number to the right of each answer selected. The highest possible total for the whole test would be sixty-three, if all 3's were selected. Since the lowest possible score for each question is zero, the lowest possible score for the test would be zero. The level of depression can then be evaluated according to the scoring below.

Total Score of All Selected Answers_____

Levels of Depression:

Total score of 0-10 = These ups and downs are considered normal

Total score of 11-16 = Mild mood disturbance

Total score of 17-20 = Borderline clinical depression

Total score of 21-30 = Moderate depression

Total score of 31-40 = Severe depression

Total score of over 40 = Extreme depression

<u>A-3 Appraisal of Diabetes Scale Scoring Tool</u>

Scoring the ADS:

1. Reverse score items for questions 2 and 6. This is done by subtracting the score assigned to the answer from 5. i.e., ADS2R = 5 - ADS2 and ADS6R = 5 - ADS6.

2. Then sum all items, using the reversed scored items for 2 and 6.

Total score = ADS1 + ADSR2 + ADS3 + ADS4 + ADS5 + ADSR6 + ADS7

There is no manual.

Interpretation is straightforward: The smaller the total score, the more positive the appraisal strategy. Thus, lower scores are better.

APPENDIX B

B-1 HUMAN USE COMMITTEE APPROVAL LETTERS

B-2 SOCIAL MEDIA GRAPHIC AND POST

B-1 Human Use Committee Approval Letter

LOUISIANA TECH
U N I V E R S I T Y.

MEMORANDUM

OFFICE OF SPONSORED PROJECTS

TO: Ms. Lauren Rosenston and Dr. Vicky Green

FROM: Dr. Richard Kordal, Director of Intellectual Property & Commercialization (OIPC)
            rkordal@latech.edu

SUBJECT: HUMAN USE COMMITTEE REVIEW

DATE: May 12, 2021

In order to facilitate your project, an EXPEDITED REVIEW has been done for your proposed study entitled:

"Quality of Life, Depression and Self Efficacy in Adults with
Type 2 Diabetes Mellitus"

HUC 21-097

The proposed study's revised procedures were found to provide reasonable and adequate safeguards against possible risks involving human subjects. The information to be collected may be personal in nature or implication. Therefore, diligent care needs to be taken to protect the privacy of the participants and to assure that the data are kept confidential. Informed consent is a critical part of the research process. The subjects must be informed that their participation is voluntary. It is important that consent materials be presented in a language understandable to every participant. If you have participants in your study whose first language is not English, be sure that informed consent materials are adequately explained or translated. Since your reviewed project appears to do no damage to the participants, the Human Use Committee grants approval of the involvement of human subjects as outlined.

Projects should be renewed annually. *This approval was finalized on May 12, 2021 and this project will need to receive a continuation review by the IRB if the project continues beyond May 12, 2022.* ANY CHANGES to your protocol procedures, including minor changes, should be reported immediately to the IRB for approval before implementation. Projects involving NIH funds require annual education training to be documented. For more information regarding this, contact the Office of Sponsored Projects.

You are requested to maintain written records of your procedures, data collected, and subjects involved. These records will need to be available upon request during the conduct of the study and retained by the university for three years after the conclusion of the study. If changes occur in recruiting of subjects, informed consent process or in your research protocol, or if unanticipated problems should arise it is the Researchers responsibility to notify the Office of Sponsored Projects or IRB in writing. The project should be discontinued until modifications can be reviewed and approved.

Hi everyone, I am a nutrition graduate student currently working to complete my masters. I am looking at the relationship between nutrition education and type 2 diabetes with the goal of gathering information to help clinicians to better care for people with type 2 diabetes. Please consider taking the survey on the link below. Thank you!

REFERENCES

Bullard KM, Cowie CC, Lessem SE, et al. (2016). Prevalence of Diagnosed Diabetes in Adults by Diabetes Type – United States. *MMWR Morb Mortal Wkly Rep 2018*, *67,* 359-361. doi: 10.15585/mmwr.mm6712a2

Carey, M. P., Jorgenson, R. S., Weinstock, R. S., Sprafkin, R. P., Lantinga, L. J., Carnrike, C. L. M., Jr., Baker, M. T., & Meisler, A. W. (1991). Reliability and validity of the appraisal of diabetes scale. *Journal of Behavioral Medicine, 14*, 43-51.

"Depression." *National Institute of Mental Health*, U.S. Department of Health and Human Services, Feb. 2018, www.nimh.nih.gov/health/topics/depression/index.shtml.

Early, K. & Stanly, K. (2018). Position of the Academy of Nutrition and Dietetics: The Role of Medical Nutrition Therapy and Registered Dietitian Nutritionists in the Prevention and Treatment of Prediabetes and Type 2 Diabetes. *Journal of the Academy of Nutrition and Dietetics, 118,* 343-353. doi: 10.1016/j.jand.2017.11.021

Franz, M. J. & MacLeod, J. (2018). Success of nutrition-therapy interventions in persons with type 2 diabetes: challenges and future directions. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 11,* 265-270.

Gois, C., Duarte, T. A., Paulino, S., Raposo, J. F., Carmo, I. & Barbosa, A. (2018) Depressive symptoms are associated with poor glycemic control among women with type 2 diabetes mellitus. *BioMed Central Research Notes, 11,* 1-6. doi: 10.1186/s13104-018-3141-z

Holt, R., de Groot, M. & Golden, S. (2014) Diabetes and Depression. *HHS Public Access, 14,* 491. doi: 10.1007/s11892-014-0491-3

Jackson-Koku, G. (2016). Beck Depression Inventory, *Society of Occupational Medicine, 66,* 174-175. doi: 10.1093/occmed/kqv087

Jing, X., Chen, J., Dong, Y., Han, D., Zhao, H., Wang, X…Ma., J. (2018) Related factors of quality of life of type 2 diabetes patients: a systematic review and meta-analysis. *Health and Quality of Life Outcome, 16,* 1-14. doi: 10.1186/s12955-018-1021-9

106

Khan, P., Qayyum, N., Malik, F., Khan, T., Khan, M., & Tahir, A. (2019) Incidence of Anxiety and Depression Among Patients with Type 2 Diabetes and the Predicting Factors. *Cureus Journal of Medical Science, 11,* e4254. doi: 10.7759/cureus.4254

Kian, A. A., Vahdani, B., Noorbala, A. A., Nejatisafa, A., Arbabi, M.,… Nakhjavani, M. (2018) The Impact of Mindfulness-Based Stress Reduction on Emotional Wellbeing and glycemic Control of Patients with Type 2 Diabetes Mellitus. *Journal of Diabetes Research,* 1-6. doi: 10.1155/2018/1986820

Lemon, C. C., Lacey, K., Lohse, B., Hubacher, D. O., Klawitter, B., & Palta, M. (2004). Outcomes Monitoring of Health, Behavior, and Quality of Life after Nutrition Intervention in Adults with Type 2 Diabetes. *Journal of the American Dietetics Association, 104,* 1805-1815. doi: 10.1016/j/jada.2004.09.024

Mansori, K., Shiravand, N., Shadmani, F. K., Moradi, Y., Allahmoradi, M., Ranjbaran, M., …Valipour, M. (2019) Association between depression with glycemic control and its complications in type 2 diabetes. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 13,* 1555-1560. doi: 10.1016/j.dsx.2019.02.010

Marrero, D. G., Kraft, S. K., Mayfield, J., Wheeler, M. & Fineberg, N. (2000). Nutrition Management of Type 2 Diabetes by Primary Care Physicians. *Journal of General Internal Medicine, 15,* 818-821.

Martino, G., Caputo, A., Bellone, F., Quattropani, M. C., & Vicario, C. M. (2020). Going Beyond the Visible in Type 2 Diabetes Mellitus: Defense Mechanisms and Their Associations With Depression and health-Related Quality of Life. *Frontiers in Psychology, 11,* 1-8. doi: 10.3389/fpsyg.2020.00267

Nair, R. & Kachan, P. (2017). Outcome tools for diabetes-specific quality of life. *Canadian Family Physician, 63,* 310-315.

Opie, R. S., Itsiopoulos, C., Parletta, N., Sanchez-Villega, A., Akbaraly, T. N., Ruusunen, A., & Jacka, F. N. (2017). Dietary recommendations for the prevention of depression. *Nutritional Neuroscience, 20,* 161-169. doi: 10.1179/1476830515Y.0000000043

Roy, M., Sengupta, N., Sahana, P. K., Das, C., Talukdar, P., Baidya, A., & Goswami, S. (2018). Type 2 diabetes and influence of diabetes- specific distress on depression. *Diabetes Research and Clinical Practice, 143,* 194-198. doi: 10.1016/j.diabres.2018.07.006

Shrestha, M., Al-Ghareeb, A., Alenazi, F. & Gray, R. (2019). Association between subthreshold depression and self-care behavior in people with type 2 diabetes: a protocol for systematic review of observational studies. *BioMed Central Systematic Reviews, 8,* 1-9. doi: 10.1186/s13643-019-1084-7

Siopis, G., Colagiuri, S. & Allman-Farinelli, M. (2020). Dietitians' experiences and perspectives regarding access to and delivery of dietetic services for people with type 2 diabetes mellitus. *Heliyon*, *6*, 1-7.

Stone, C. L. (2020). A population-based measure of chronic disease severity for health planning and evaluation in the United States. *AIMS Public Health, 7,* 44-65.

SV, B., Tataru, C., Kobylinkska, L., Georgescu, E., Zahiu, D., …Zagrean, L. (2016). The association between diabetes mellitus and depression. *Journal of Medicine and Life, 9,* 120-125.

Vigersky, R. A., Levinson, J. & Fitzner, K. (2013). Barriers and Potential Solutions to Providing Optimal Guideline-Driven Care to Patients With Diabetes in the U.S. *Diabetes Care Journal, 36,* 3843-3849. doi: 10.2337/dc13-0680

Wang, Y., Lopez, J. M., Bolge, S. C., Zhu, V. J. & Stang, P. E. (2016). Depression among people with type 2 diabetes mellitus, US National Health and Nutrition Examination Survey (NHANES), 2005-2012. *BMC Psychiatry, 16,* 1-16. doi: 10.1186/s12888-016-0800-2

Zimmerman, I. R., Silva, M. T., Galvao, T. F., & Pereira, M. G. (2017). Health-related quality of life and self-reported long-term conditions: a population-based survey. *39*, 62-68. doi: 10.1590/1516-4446-2015-1853

Zurita-Cruz, J. N., Manuel-Apolinar, L., Arellano-Flores, M. L., Gutierrez-Gonzalez, A., Najera-Ahumada, A. G., & Cisneros-Gonzalez, N. (2018) Health and quality of life outcomes impairment of wuality of life in type 2 diabetes mellitus: a cross-sectional study. *Health and Quality of Life Outcomes, 16,* 1-7. doi: 10.1186/s12955-018-0906-y