2022

# Prediabetes, Implementation of ADA Practice Guidelines and Provider Perspective

Kimberlee May Manguiat-lang
*Walden University*

# Walden University

College of Health Professions

This is to certify that the doctoral dissertation by

Kimberlee Manguiat-Lang

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Cheryl Cullen, Committee Chairperson, Public Health Faculty
Dr. John Oswald, Committee Member, Public Health Faculty
Dr. Raymond Panas, University Reviewer, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2022

Abstract

Prediabetes, Implementation of ADA Practice Guidelines and Provider Perspective

by

Kimberlee Manguiat-Lang

MS, Texas Woman's University, 1998

BS, Hood College, 1992

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2022

Abstract

Prediabetes occurs before the development of diabetes in some people. Practitioners who educate people about prediabetes are not consistently using the latest evidence-based practice guidelines. The purpose of this mixed-method study was to fill a gap in the literature by providing evidence of the provider practices, attitudes and barriers when implementing American Diabetes Association (ADA) practice guidelines for the prediabetic patient. The Theory of Planned Behavior applies to evidence-based practice and the implementation of evidence-based practice guidelines. Research questions for this study focused on determining rate of compliance with ADA clinical practice guidelines from health care professionals to include providers in Florida. The quantitative sample was a convenience sample of licensed health care providers in Florida (n=436) who have patients with prediabetes and (n=410) reported responses for screening and treatment preferences for prediabetes. The sample for the qualitative portion of the study were providers (n=5) who participated in interviews after questionnaire completion. Descriptive and inferential statistics that relate to usage of the ADA standards of care were analyzed. A one sample proportion test with confidence interval for screening was not significant at the <.05 level. Interview data were analyzed for themes using hand and auto coding. Self-reported attitudes (3/5) were more favorable than not favorable regarding the preventive treatment of patients with diabetes. Qualitative findings indicate attitudes or barriers may play a role in screening for prediabetes. Potential social change implications include care improvements related to adequate provider resources and support for preventive care for the prediabetic patient potentially reducing risks, complications and costs associated with developing type 2 diabetes mellitus.

# Prediabetes, Implementation of ADA Practice Guidelines and Provider Perspective

by

Kimberlee Manguiat-Lang

MS, Texas Woman's University, 1998

BS, Hood College, 1992

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2022

Acknowledgments

I would like to acknowledge my committee members, Dr. Cheryl Cullen, Dr. John Oswald, and URR reviewer Dr. Raymond Panas, with special thanks to Dr. Cheryl Cullen for her expert guidance, leadership, and willingness to work with me throughout the dissertation process. I would also like to acknowledge Dr. Sarala Narayana, Dr. Asha Basavareddy, and Ashwitha Shruti Dess for their willingness to provide me with prediabetes questionnaire for use in my project.

Table of Contents

List of Tables

List of Figures

# Chapter 1: Quality of Care and Prediabetes

## Introduction

Quality of care provided by primary care physicians may influence the patient outcome (Cabana et al., 2006). Prediabetes may progress to diabetes over several years (Aroda & Ratner, 2008). The numbers of people with prediabetes in the United States increased from 79 million to 86 million between 2010 and 2012 (Centers for Disease Control and Prevention [CDC], 2011; 2014). There are 37% of adults in the United States with prediabetes yet based on prior and current data many did not know they had prediabetes, only 11% and based on more recent data 13.3% (American Diabetes Association [ADA], 2015;CDC, 2014; 2020). There are guidelines for the management of prediabetes from the ADA, but evidence in the literature that many providers do not follow the specific recommendations by the ADA, and that approach may vary by specialty (Anderson et al., 2015; Basavareddy et al., 2015).

Addressing health care provider awareness, understanding and attitude of protocols, as well as physician and other health care providers endorsement of practices, were essential considerations in providing care to people with type 2 diabetes mellitus (McMaughan et al., 2016). ADA (2010) screening guidelines were crucial to screen more people and to identify more people with prediabetes when using predictive models compared to the United States Preventative Task Force guidelines. However, the need to test those who do not have an annual visit to primary care and the need to improve screening approaches may benefit to improve care for patients with prediabetes (Dall et al., 2014).

People with diabetes have higher health care costs that are significantly higher, as much as 2.3 times more than the costs would be without diabetes (Alva et al., 2014; CDC, 2014; Huang et al., 2009; Zhuo et al., 2013). Medical costs associated with complications and comorbidities related to type 2 diabetes mellitus (DM) may vary considering gender, length of time with diabetes and other factors. Coronary heart disease, congestive heart failure, hemiplegia, and amputation associated with 70% to 150% increased cost and end-stage renal disease on dialysis a 300% cost increase (Li et al., 2013).

## Background Information

Kupersmith et al. (2007) suggested that the numbers of veterans living with diabetes exceeds 25%, and further discussed the use of electronic health record as a potential tool to improve quality of care. Recommendations in the 2016 Standards of Medical Care in Diabetes and in more recent versions of the Standards of Medical Care in Diabetes have specific suggestions for the prevention or delay of type 2 DM which include both lifestyle modification, such as losing weight and increasing physical activity, and antidiabetic medications such as metformin. Utilizing technology that utilizes mobile applications, internet-based learning to record , and assists with lifestyle modification and network support and diabetes prevention education may be of benefit. Health care professionals use information in the electronic medical record (EMR) within the health care system to include the veterans' health care system, to identify patients who have prediabetes, based on clinical laboratory findings, but may or may not have the problem identified on the individual's problem list. Health care professionals may also review the EMR to identify implemented interventions and determine trends of medical

and nursing practice with or without targeted responses, lack of interventions, and patient outcomes.

It is not possible to view the medical record to assess provider knowledge, attitude or barriers to implementation of recommended practice guidelines for people with prediabetes. Evidence in the literature shows there are challenges for primary care providers in implementing and sustaining approved clinical practice guidelines for people with diabetes and that other than traditional approach may be needed to improve care (Kirkman et al., 2002). Dissemination and implementation of evidence-based practice in mental health utilized stakeholder involvement, to include providers, to create an appropriate instrument with items for further use in dissemination and implementation research (Burgess et al., 2016). More than one-third of adults living in the United States have prediabetes, but many are not aware of their condition (CDC, 2016; 2020, Dall et al., 2014; Geiss et al., 2010). Specific recommendations to help target risk of development of type 2 diabetes are in the ADA Standards of Care (2016) and in more current ADA Standards of Care. Lifestyle modification has been shown to be effective in reducing the risk of development of type 2 diabetes mellitus (Diabetes Prevention Program Research Group, 2009). Researchers have discussed the need for further study related to clinical practice guidelines as well as barriers to adherence to clinical practice guidelines (Barnes et al., 2015).

**Electronic Health Record and Meaningful Use**

The electronic health record has increased in popularity and use by health providers (Heisey-Grove et al., 2014). The Centers for Medicare and Medicaid Services (CMS) incentive payments lessened some of the costs associated with the use of

electronic health record systems (Heisey-Grove et al., 2014). The Medicare and Medicaid incentive program rewarded individual physicians or hospitals with incentives (Maxson et al., 2010). Implementation, the electronic health record incentive program, has progressed through three stages and to receive incentive payment CMS has established objectives and criteria for meaningful use (CMS, 2017).

In each step, there are core objectives eligible providers were required to meet as well as minimum measures to achieve goals. There are also additional menu objectives and reports of quality measures needed to establish meaningful use and meet criteria for the incentive payment. For example, in stage one to reach the clinical decision support rule at least one clinical decision support or alert had to meet implementation for a diagnosis or treatment. In step 2 a measure of clinical decision support includes implementation of five clinical decision support interventions relating to four or more clinical quality measures for the entire reporting period. In modified stage 2 the second proposal for an eligible hospital would be implementing a drug-drug and drug allergy interaction for the whole reporting period (CMS, 2017).

One goal of the meaningful use of electronic medical records was to improve quality of care (Shea et al., 2015). Some of the clinical quality measures include blood pressure measurement for those with hypertension, adult weight screening and follow-up, and preventive care to include tobacco use assessment and cessation intervention. All providers had to report on these measures. There were additional quality measures, such as breast cancer screening those providers had to choose a certain number of to report on (CMS, 2017).

Regional Extension Centers set up by the Office of National Coordinator for Health Information Technology could help providers by both identifying and working through challenges that are a part of putting electronic health record technology into place as well as the meaningful use of electronic health record (Heisey-Grove, 2014). In one study of a single integrated health system, more extensive practices and those with more Medicare-eligible providers were able to meet meaningful use objectives; it suggested that small practices might need more outside support or assistance with meaningful use (Shea et al., 2015). Large practices may have more resources, and use of specific, meaningful use objectives, such as electronic prescribing and Medicare as compared to Medicaid providers had to show significant utilization in the first year of stage 1 (Shea et al., 2015).

Similarly, other research implicated that for improved quality of care in small practice settings in New York, increased technological assistance with EMR implementation over time could result in improvements in care (Ryan et al., 2013). Technology is expected to continue to expand and influence the provision of healthcare over the next ten years (Risling, 2017). Risling (2017) suggested that nurse educators consider the role of electronic health record and other technology to include data analytics in the development of educational curriculum.

## Purpose of the Study

The purpose of this mixed-method study was to fill a gap in the literature by providing evidence of the provider practices and attitudes when implementing ADA practice guidelines while treating the prediabetic patient.

The study helped provide evidence identifying the level of understanding and the attitudes of healthcare workers during utilization of prediabetes intervention with patients. Obtaining evidence of what responses are being or not being provided for outpatients who have prediabetes  provided information that may be relayed to healthcare leaders to determine factors that impact adherence to the evidence-based intervention. Obtaining information from providers about their attitudes and behaviors in providing care to the prediabetic patient may be relayed to healthcare leaders to inform future intervention and research to ensure optimal care to the patient with prediabetes. The problem is prediabetes signifies an increased risk of developing diabetes and is a problem in the United States (Aroda & Ratner, 2008; Harris et al., 1992). Practitioners who educate people about prediabetes were not consistently using the latest evidence-based practice guidelines (Hooks-Anderson et al., 2015)

Diabetes has significantly increased in the United States and the prevalence in the veteran population may be even higher than in the general population. Early identification of veterans with prediabetes could prevent or delay development of type 2 DM along with co-morbidities and complications associated with type 2 DM. Based on the Diabetes Prevention Program clinical trial, it is possible to delay or prevent the onset of diabetes.

Providers do not consistently utilize clinical guidelines for the treatment of diabetes and people with prediabetes in research. There may be differences in guideline adherence and practice based on provider specialty (Anderson et al., 2015; Kirkman et al., 2002; Santana, 2013). A gap in the literature exists regarding the attitudes of healthcare worker's inconsistent identification and intervention for people with

prediabetes. To further evaluate provider perspective; information from the medical professional concerning their knowledge, attitudes, and behaviors, as well as perceived barriers toward the treatment of the patients with prediabetes, was essential both to help increase adherence to guidelines and to improve care for the patients.

Research on obesity and adherence to treatment guidelines has similarly shown to need improvement and suggests that including interprofessional team members may be beneficial and future study should include evaluating barriers to adherence to guidelines (Barnes et al., 2015).

## Theoretical Framework

The Theory of Planned Behavior links beliefs to behavior and was used to understand health professional intention of which attitudes, subjective norms and perceived behavioral control are part of achieving the behavioral objective (Ajzen, 1991). The theory of planned behavior has applicability to evidence-based practice and the implementation of evidence-based practice guidelines (Burgess et al., 2016). Provider perspective in the use of clinical or evidence-based guidelines for people to include veterans with prediabetes may help inform further intervention or research. Possible social implications are the prevention of diabetes or conversion of prediabetes to diabetes, when possible, which may result in improved quality of life, increased longevity and reduced medical costs. Costs associated with the treatment of type 2 DM are significant, and there are higher costs associated with patients who have DM and a Hemoglobin A1c level > 8% (Oglesby et al., 2006).

## Research Questions and Hypothesis

The hypothesis for the quantitative portion of the research was health care providers in Florida report using interventions in practice that suggest a higher rate of compliance with the ADA clinical practice guidelines than the national average for patients with prediabetes.

$H_O1$: Health care providers in Florida report using interventions in practice that do not suggest a higher rate of compliance with the ADA clinical practice guidelines than the national average for patients with prediabetes.

$H_a2$: Health care providers in Florida report using interventions in practice that suggest a higher rate of compliance with the ADA clinical practice guidelines than the national average for patients with prediabetes.

RQ1-Quantitative-Do primary care providers in Florida report using interventions in practice that suggest a higher rate of compliance with ADA clinical practice guidelines for prediabetes patients as compared to the national average?

RQ2-Qualitative-What are the self-reported attitudes and barriers of primary care providers regarding the preventative treatment of patients with prediabetes?

RQ3-Qualitative-What differences exist in attitude and barriers for providers that report using the clinical practice guidelines for prediabetes compared to those that report not using the guidelines for prediabetes?

## Significance

The importance of the study was to gain evidence from the perspective of the healthcare provider regarding attitudes, barriers, and educational competencies that affect the provision of care of the patient with prediabetes. The study added some evidence

about provider practice that may help fill a gap in the literature and help to improve care for the patient with prediabetes. There are growing numbers of patients with prediabetes; however, providers may not be using recommended standards, and further information was needed to help inform future educational initiatives or other interventions to inform care improvements for the patient with prediabetes. Prior research on perspectives of diabetes care professionals relayed the change in approach to diabetes care as well as identification of some barriers to optimal diabetes care to include lack of time, available resources, and lack of psychosocial support (Stuckey et al., 2015).

## Nature of the Study

The study utilized a mixed method approach. Quantitative research helped provide an understanding of provider practice. Qualitative analysis was used to determine themes among primary care practitioner attitudes, barriers and other factors influencing the use of recommended practice guidelines for people with prediabetes. Quantitative data was vital to develop descriptive baseline statistics to show what is occurring within the healthcare system. Qualitative evidence was necessary to facilitate an understanding of provider attitude, barriers, and other factors that relate to providing care to the patient with prediabetes, from provider experiences and perspectives. The quantitative and qualitative data analysis provided valuable information for improving care. The use of only one type of data collection type in this context would have provided limits on a more in-depth understanding of the problem.

## Definition of Terms

*Diabetes Mellitus*: A group of metabolic diseases portrayed by high blood sugar because of a problem with insulin secretion, insulin action or both (ADA, 2004).

*Hemoglobin A1c:* A test that measures hemoglobin A1c in the blood to determine average blood sugar concentrations past 2-3 months (Merriam-Webster, n.d.)

*Obesity*: Weight that is higher than what is a healthy weight for height, a body mass index (BMI) of 30 or more falls into the obese range (Centers for Disease Control and Prevention, 2016)

*Outcome Assessment*: Research measure to assess quality and effectiveness of healthcare by specified result or condition of the patient at the end of treatment (Medical Dictionary, 2013).

*Prediabetes*: Blood sugar levels higher than normal but not high enough to be diagnosed diabetes, indicated by A1C 5.7-6.4%, or fasting blood glucose of 100-125 mg/dl, or an oral glucose tolerance test 2 hours of 140 mg/dL-199 mg/dl (ADA, 2014)

*Primary Care Provider:* A health care professional who sees people for common medical problems, usually a physician but may also be an advanced registered nurse practitioner or physician assistant (U.S. Library of Medicine, 2015)

*Health Care Professional Subgroups*: Medical Doctors – both Generalist and Specialist Practitioners including Public Health Doctors, Nursing Professionals including Public Health Nurses, Midwifery Professionals, including Public Health Midwives, Dentists, Pharmacists, and other minor groups (World Health Organization, 2013).

*Veteran*: A person who served in the active military, naval, or air service who was discharged or released under conditions other than dishonorable (Legal Information Institute, n.d.)

## Assumptions and Delimitations

Assumptions for this study included that health care providers and professionals were willing to participate in the study. I also assumed that the quantitative data collected and the information from providers and health professionals were able to be used together to provide valuable data to leadership to improve care. Individual providers and health professionals were invited to participate in an interview and to complete a questionnaire. The data collector informed providers and health care professionals that the data provided was used to understand their preferences for providing treatment to the prediabetic patients and to help facilitate quality improvement. Participants were reassured that their participation is voluntary, they can choose not to participate at any time, and that data will only be reported in aggregate form to facilitate honesty in response. Expert review of the questionnaire occurred at the beginning of the project.

Limitations of the project included using a convenience sample within the healthcare system, with access to and willing to complete a computer-based survey via anonymous survey link which limited the ability to generalize results to other populations. Time was another limitation. The data collected applied to the period of data collection, data collected during another time may yield different results due to changes in staff or procedures. Another limitation was both health care professional and or patient behavior. Education or other initiatives that related to improving care and to reducing disease risk may or may not be followed by the patient or health care professional or provider.

Delimitations for the study were inclusion criteria for health care professionals or provider participation to be Florida based who chose to participate. The geographical

location of the study was Florida. The results may not apply to other places or for different types of providers, health care professionals or healthcare systems. The goal of the study was to improve care within the local healthcare systems and to highlight awareness of the patient with prediabetes which limited both the scope and nature of data collected and how data was utilized and managed.

## Implications for Social Change

Improving care for people with prediabetes is vital to reduce the risk of the development of type 2 diabetes for all people to include veterans. Diabetes contributes to the death of more than 234,000 people in the United States yearly (ADA, 2015;CDC, 2014). Preventing diabetes may result in lower health care costs, improved health status, and enhanced quality of life. An additional social change implication includes diffusion of the intervention for prevention to the families or communities of the patient with prediabetes.

## Summary

It is estimated there were 86 million people with prediabetes in the United States (CDC, 2014; Dall et al., 2014). Data has shown that the numbers or percentage of people with diabetes is higher in the veteran population than in the general population. Providers may or may not be using the recommended standards of care from the American Diabetes Association when evaluating and treating patients. The theory of planned behavior has been demonstrated to be appropriate for implementation of clinical guidelines; however, the approach may need to vary when targeting different professions (Kortteisto et al., 2010). There was and continues to be a need for additional research on provider attitude, knowledge, practice, and barriers to implementation of guidelines in clinical practice. The

evidence could help improve care for people with prediabetes within the health care system in the community to reduce the risk of progression to diabetes or delay onset of diabetes and its associated devastating consequences and costs.

# Chapter 2: Literature Review

## Introduction

There were an estimated 86 million adults in America with prediabetes (CDC, 2011). Risk of developing type 2 diabetes may be reduced, as much as 58%, for people with diabetes who take part in a structured lifestyle change program (CDC, 2017). People with prediabetes need to be made aware that they have prediabetes and have education on how lifestyle approach or other treatment may have potential to reduce the risk of development of type 2 diabetes. Health care providers and professionals who provide care to people with prediabetes may be able to inform, educate or refer people to lifestyle intervention programs to reduce the risk of development of type 2 DM. A literature review was completed using multiple databases to include search terms such as prediabetes, provider, theory and is further described in consideration of the literature review process and results from the selected literature.

## Review of Literature Process

The sources reviewed were research articles in English with preference given to more recent research articles at the time this project was initiated for literature review choice. The studies were pertinent to prediabetes and provider practice, or theory as related to provider practice and provider and health care professional practice guideline and improvement. The textbook material relevant to the theory of planned behavior and statistical data was part of the literature review. The Walden University Library was used to search for studies as well as the Department of Veterans Affairs Medical Library.

## Results

Using CINAHL Plus with Full text and search terms prediabetes and provider to search for peer-reviewed research 13 articles were found seven of which were useful. The search terms Medline with full-text peer-reviewed study and prediabetes and provider only resulted in two selections search term prediabetes was applied and resulted in 30 articles, three which were applicable for this review. Using CINAHL and search term prediabetes 20 items were found. Search terms prediabetes and provider using Thoreau multi-database search for peer-reviewed research 20 articles were found, five of which were used. Search terms provide behavior and prediabetes in multi-database search resulted in two selections, both of which were used in literature review, but one was a duplicate of research from other search terms. Using search term provider attitude and prediabetes CINAHL Plus full-text database one research article was found and used. Search term provider attitude and exercise counseling using CINAHL Plus full text and Medline simultaneous search resulted in one research article. Using ERIC and search term prediabetes, produced two research articles for review. CINAHL with full text and Medline concurrent search terms provider attitude and obesity resulted in 10 items one of which was used. Academic Search complete database search using terms prediabetes and provider resulted in 26 research articles, seven which were used however two of the seven were also in the previous search. An additional search was completed using Medline with Full Text and CINAHL using search term provider and clinical practice guidelines; peer-reviewed articles from 2012, this resulted in 28 articles from Medline of which seven were able to be used and 198 from CINAHL of which eleven were ready to be used for this study. An additional search for prediabetes and theory of reasoned action

and theory of planned behavior was completed using the VA Library Network, and 12 other articles were chosen. Additional literature was reviewed from references obtained in the initial literature review, see Table 1.

**Table 1.0**

*Research Chart*

| Key Term Searched | Scholarly | Secondary | Textbook | Reviewed | Used |
|---|---|---|---|---|---|
| prediabetes and provider | 61 | **7** | | 40 | 21 |
| prediabetes | 50 | 3 | | 25 | 17 |
| behavior and prediabetes | 2 | | | | 2 |
| provider attitude and prediabetes | 1 | | | 1 | 1 |
| provider attitude and exercise counseling | 1 | | | 1 | 1 |
| provider attitude and obesity | 10 | | | 6 | 1 |
| provider and clinical practice guidelines | 28 | 7 | 1 | 20 | 7 |

| | | | | | |
|---|---|---|---|---|---|
| provider and clinical practice | 198 | 5 | | 35 | 11 |
| prediabetes, theory of reasoned action and theory of planned behavior | 26 | 2 | 2 | 17 | 12 |

## Introduction to Prediabetes

There were 86 million American adults with prediabetes (ADA, 2015). Early intervention may delay or prevent the development of type 2 DM. Researchers estimate that by the year 2050, 1 in 3 American adults will have diabetes, if current diabetes development pattern continues (ADA, 2015). Rattay and Rosenthal (2014) advised that increasing the identification of patients with prediabetes in the primary care setting is one crucial step to prevent diabetes (Rattay & Rosenthal, 2014). Evidence in research suggests the importance of understanding how lifestyle intervention in prediabetes may reduce the risk of the development of type 2 diabetes mellitus (Eikenberg & Davy, 2013). Prediabetes is a treatable clinical condition.

### Prevalence

There were an estimated that 79 million American adults with prediabetes in 2010, 35% of adults, age 20 years or older had prediabetes based on fasting blood glucose or hemoglobin A1C values, and 50% of those ages 65 years or over (CDC,

2011). The number of people with prediabetes had increased since 2010, and there were an estimated 86 million people with prediabetes (American Diabetes Association, 2014).

**Prediabetes Defined**

The definition of prediabetes included a fasting serum glucose of 100 to less than 126 mg/dL or serum blood hemoglobin A1c 5.7% to less than 6.5% or a two-hour plasma glucose of 140 to less than 200 mg/dL after a 75-gram oral glucose tolerance test (ADA, 2013). The definition of prediabetes may have different measures based on the organization defining prediabetes (Bansal, 2015). A blood test may be ordered by a medical provider to determine if a person has prediabetes.

**Pathophysiology of Prediabetes**

The progression from increased blood glucose levels to diabetes may occur over many years and over stages where the blood glucose may either stay stable or decompensate, and there is an indication that beta cell function has impairment in the prediabetes stage (Bergman, 2013). Beta cells are a type of cell within the islet cells of the pancreas that detect blood sugar and release insulin to maintain healthy blood sugar levels (Diabetes Research Institute, n.d.; Keane & Newsholme, 2014.) Both insulin resistance and impaired glucose sensing occur contributing to elevated blood sugar, and while there may be genetic factors, excess tissue fat as a metabolic component and overweight is a significant obstacle with insulin secretion (Ferrannini et al., 2011). Other pathophysiological mechanisms in prediabetes include insulin resistance both at the liver and in peripheral tissues, and defective detection at the beta cell, leading to hyperglycemia and eventually to type 2 DM, in some individuals (Ferrannini et al.,

2011). Insulin resistance is a condition in which the cells do not usually respond to insulin which may lead to higher insulin requirements to keep the blood sugar regular.

Recommended treatment of prediabetes may need to be further defined to include clinical characteristics, such as cardiovascular problems and other medical histories. Medication such as metformin may benefit for those unable to make lifestyle changes or for whom lifestyle changes are not effective (Bergman, 2013). Metformin is an oral medication that helps lower blood sugar levels in the blood. Evidence in the literature further suggested the different pathophysiological characteristics associated with impaired fasting glucose and impaired glucose tolerance, with consideration for oral glucose tolerance testing, for those with impaired fasting glucose to accurately assess increased risk of both diabetes mellitus development and cardiovascular disease development in people (Abdul-Ghani et al., 2016).

**Treatment for Prediabetes**

Treatment for prediabetes may include lifestyle intervention, pharmacotherapy, or bariatric surgery (Bansal, 2015). Lifestyle interventions may focus on improved diet to help facilitate weight loss and increased physical activity. Pharmacotherapy involves the use of medications to treat the medical condition. Bariatric surgery is a surgical intervention to promote weight loss in an individual.

Evidence in the literature suggested people with prediabetes may not be aware of their condition (Geiss et al., 2010; Gopalan et al., 2015). Many patients with prediabetes did not receive appropriate health care advice about behaviors necessary to manage their condition (Geiss et al., 2010). Similarly, medical records in a clinic setting did not demonstrate care was provided using the 2012 ADA Standards of Care (Santana, 2013).

McMaughan et al. (2016), examined physician attitudes concerning the utilization of diabetic clinical protocols. The researchers found physicians surveyed did not see the rules of significant benefit (McMaughan et al., 2016).

Literature reviewed elucidates that prediabetes impacts many people in the United States and the progression to diabetes may occur over many years. The definition may vary by defining the organization, however, to prevent disease progression, early intervention is vital. The financial and other costs associated with the development of diabetes were an estimated total cost of 174 billion in the United States in 2007 (CDC, 2011). Healthcare providers and professionals are one group of individuals that may be able to provide treatment guidelines and education or other intervention to reduce the risk of the development of diabetes in people with prediabetes. Data on what is occurring in patients who have prediabetes within the healthcare system was not frequently available in the literature.

## Comorbidities of Patients with Diabetes and Prediabetes

### Hypertension

Many adults with hypertension which is high blood pressure also have diabetes (Gillespie & Hurvitz, 2013). There was an overlap in many risk factors associated with hypertension and diabetes and people with diabetes and hypertension are at increased risk for macro vascular and microvascular complications (Long & Dagogo-Jack, 2011). Macro vascular refers to the large blood vessel, and complications may include coronary artery disease, peripheral arterial disease or stroke; microvascular refers to a small vessel; complications may include diabetic retinopathy, nephropathy, or neuropathy (Fowler, 2008). Target blood pressures may need to be individualized considering both

nephropathy and cardiovascular comorbidity factors and suggested there was a need for earlier intervention, in the prediabetes stage to decrease the risk of nephropathy (Ritz et al, 2011). Patients with hypertension may be more likely to progress from prediabetes to diabetes and have higher associated medical costs (Francis et al., 2011).

**Cardiovascular Disease**

Undiagnosed diabetes and prediabetes were in patients with non-ST-segment elevated acute coronary syndrome patients, and diabetes was shown to relate to worse short-term outcomes in these patients (Giraldez et al., 2013). The classification of patients ST-segment elevation or without ST-segment elevation, based on the electrocardiogram, with the latter category, subdivided into non-ST Myocardial Infarction or unstable angina, the patient management is guided by diagnosis (Bassand et al., 2007). The association of cardiovascular disease with diabetes and prediabetes presents a severe public health problem (Mellbin et al., 2010). The need for intensive therapy and addressing alterations in blood glucose control in these patients suggests that many patients are treated safely with intensive medical treatment (Mellbin et al., 2010). Individuals with type 2 diabetes have an increased risk of morbidity and mortality with an associated cardiovascular disease, and medication may be of benefit for blood pressure and weight reduction, for those unable to make lifestyle changes to reduce disease risk (Chilton et al., 2011). Targeted long-term multifactorial intervention to reduce the risk of cardiovascular events in those with type 2 diabetes may lead to better prognosis (Gaede, 2003).

**Obesity**

Obesity, having a body mass index that is 30 or higher, is a significant risk factor for prediabetes and type 2 diabetes mellitus. Prediabetes significantly increases the short-term risk of development of type 2 diabetes mellitus but may be prevented or delayed in those who can lose weight (CDC, 2016; Diabetes Prevention Program Research Group, 2009; Khaodhiar et al., 2009). Weight loss is one component of the recommendations for the prevention of diabetes. Studies examining clinical practice guidelines as applied to other types of health problems have shown tools such as the electronic medical record, audit, feedback and pharmacy support have been shown to improve adherence to guidelines (Okelo, 2013).

There were clinical reminders for other items related to health in the computerized medical record keeping system such as computerized patient record keeping system, which was the name of one electronic medical record system used within the VA health system, and this may be a consideration for prediabetes to include other associated comorbid conditions.

Potential health hazards associated with prediabetes include advancing to diabetes, microvascular disease, retinopathy and neuropathy, kidney disease, and increased risk for cardiovascular disease (Abul-Ghani et al., 2016; Bansal, 2015). Associated comorbid conditions such as hypertension, cardiovascular disease, and obesity in the context of prediabetes deserve further study.

The literature findings indicate many other health conditions relate to diabetes. The electronic medical record is one tool that may be used to improve care. Other health conditions deserve further study not only in the context of diabetes but also in the context

of prediabetes. Earlier intervention may lead to early prevention. There was limited literature about clinical practice guideline application and provider attitudes and beliefs for prediabetes when compared to diabetes.

## Provider Communication and Aspects of Care

Okosum and Lyn (2010) indicated that people who are informed they have pre-diabetes might be more likely than those who are not aware they have prediabetes to make lifestyle changes to prevent the development of type 2 DM. People who lack awareness of having prediabetes do not have the opportunity to take steps to prevent diabetes (Gopalan et al., 2015). Clear communication about disease risk and ensuring patients appropriately understand medical terminology used to communicate risk is necessary to help facilitate lifestyle change (Tarasova et al., 2014).

To ensure the effectiveness of patient communication materials need to be appropriate for the target group regarding patient needs, age, and literacy capability (Lefebvre et al., 1995). Health literacy addressed as part of the communication, and within a cultural context, visual literacy, computer literacy, informational literacy and other skills are essential to improve communication for target population (U.S. National Library of Medicine, 2017). Hersh et al., (2015) suggested printed material be written to target the fifth grade to a sixth grade reading level. High patient-centered communication, as opposed to little patient-centered physician communication, was viewed more active by patients in one study (Adams et, al., 2015). The discussion should be tailored to meet the needs of the target population of which communication style is a part (Lefebvre et al., 1995).

**Health Care Provider Education and Motivation**

Rairden et al., (2015) suggested that lack of awareness may be a barrier to health care providers making behavior changes and those medical professionals and non-physician staff such as nurses may need the education to improve the screening process for prediabetes (Rairden et al., 2015). Management of patients with prediabetes may have different interventions based on provider specialty (Anderson et al., 2015). Endocrinologists were more likely to implement lifestyle and exercise counseling as well as initiate metformin therapy compared to family practice physicians (Anderson et al., 2015). Recommendations for the prevention or delay of type 2 DM included referrals to intensive diet and physical activity counseling programs, follow-up and maintenance programs, and consideration of metformin therapy for those with body mass index higher than 35, for those over 60 years of age and for women with prior gestational diabetes (ADA, 2016; Garber, 2015).

Health care providers and professionals may not have the education and or resources needed to provide recommended care for the prediabetic patient. Performance improvement and continuing medical education are approaches that may be beneficial in provider practice for diabetes prevention initiatives. Providers and health professionals may need additional continuing medical knowledge and skills related to lifestyle management to improve in this area of practice (Dacey et al., 2013). Improving the identification of prediabetes in primary care as well as appropriate follow-up with prevention programs for diabetes may benefit to decrease the development of diabetes and its associated costs (Rattay & Rosenthal, 2014).

Evidence-based community programs and appropriate referral to these programs from the clinical setting was essential to provide education early and help reduce the risk of development of diabetes (Cloney et al., 2011). Research using lifestyle management program based on the diabetes prevention program, delivered in a community health setting was shown to have positive effects on weight and blood sugar for Hispanic women (Van Name et al., 2016). Automated programs to include software may help the provider with identification and referral of the person with prediabetes; more research was needed concerning the use of a computerized process and patient outcomes (Cloney et al., 2011).

**Health Provider and Non-medical Issues**

Cost and or payment may be non-medical factors that relate to the implementation of diabetes prevention and prevention for other public health problems. Pay for success is described as having the potential to increase use or enhance nonmedical health factors (Galloway, 2014). Pay for success begins with a contract for performance between a provider for services, often a nonprofit and a payer which may be a government agency (Galloway, 2014). The provider provides a service which is designed to be of benefit regarding cost savings related to outcome. The service provider raises money and may use investors to cover the costs of providing the program, and investors receive payments based on program success; a fourth party usually assists with the contract, fees, financing terms, and supervision (Galloway, 2014). There was some evidence some insurance companies may provide discounts for wellness-related items or use a point system for employer-sponsored health promotion programs and incentives for participation and

achieving an outcome which may lead to cost savings for premiums for participants (United Health Care Services, 2017).

Literature findings reveal that people who are made aware that they have pre-diabetes may be more likely to make changes in lifestyle that lead to disease prevention. The best form of communication may vary based on patient population and providers and health care professionals may need more education relative to intervention and prevention. There are community resources that may be accessed for prevention that vary by location. The best way to target people with prediabetes within the healthcare system to provide early intervention deserves further study and provider and health care professional input is vital to include as part of this process.

## Theory of Reasoned Action and Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is an extension of the Theory of Reasoned Action (TRA) and adds the dimension of perceived behavioral control as pertinent to both behavioral intention and to behavior (Madden et al., 1992). The TRA includes attitudes, subjective norms and intention as integral components to determine whether an action will occur. The TPB adds perceived behavioral control beliefs, including both necessary and primary resources as well as opportunities as related to behavioral control (Madden et al., 1992). Implementation science has been discussed pertinent to the barriers of use of research for evidence-based practice, that approach may vary by situation, and the benefit of using theory to help build integrated knowledge (Nilsen, 2015). Further discussed is the need to use philosophy but consider a real-world implementation of which experience is a part (Nilsen, 2015). Both the TRA and the TPB are in health-related research.

Intention to complete a behavior was part of the original TRA and is an integral component of The TPB (Ajzen, 1991). Ajzen (1991) posits that the act of carrying out the behavior depends on motivation sources such of income, time and support of others (Ajzen, 1991). Ajzen (1991) further suggested intent and control were likely to be components of achieving a behavioral objective, to include the perception of behavior control and the effort necessary to act. The TPB describes perceived behavioral control encompassing intention of behavior as predictive in behavioral accomplishment. Specific context, stability during the process, and accuracy of perceived behavioral control are other vital components for predictive validity (Ajzen, 1991). A visual representation of the TPB showed three types of beliefs to include behavioral beliefs, normative beliefs, and control beliefs along with combined attitude, subjective norm and perceived behavioral control leading to intention and behavior with a mediating factor being the actual behavioral control (Ajzen, 2006). Formative research was suggested to be of benefit to help determine which predictor variable to target in intervention and considering the weight of variable if more than one may be focused upon (Ajzen, 2006). Providing strategy and organization to include time, place, and by what method make it easier to carry out the intention to action and perform the behavior (Ajzen, 2006).

**Research using Theory of Reasoned Action**

A study examining vaccine intention toward Human papillomavirus (HPV) in men and women showed TRA constructs, personal attitudes and social support were significant for intention to be vaccinated. The part of the theory of planned behavior related to the ability to get immunized did not predict intention and was only reasonably

associated with univariate analysis for women but no significant association in the multivariate study in men and women (Fisher et al., 2013).

Research examining prediction of substance abuse provider communication with clients and medication-assisted treatment found the TRA model pertinent to counselor attitude and intention and social norm influence with both, but that counselor perceived control, a component of the TPB played a role in counselor plan (Roberto et al., 2014). The TRA could be used as a model to explain addiction counselor attitude and intention, however, the TPB component perceived behavioral control was also a factor in counselor plan and suggested intervention for these providers would be useful if organized under the TPB constructs (Roberto et al., 2014).

Evidence from a review of studies examining behavior change in dietary habits for young adults and adolescents found there to be a change in at least one construct part of the TRA or the TPB. In one of the studies, volitional control intervention increased fruit and vegetable intake compared to control and affected subjective norm and intention. Health promotion with TBP constructs was beneficial to enhance knowledge, provide more positive attitude and intention to participate in health-promoting behavior. Hackman & Knolden (2014) conclude additional research is necessary to identify the ideal theory to include TRA, TPB and other theoretical models in future studies.

**Other Research using Theory of Planned Behavior**

The TPB is discussed pertinent to various topics related to health provider behavior, in the literature. One study examined provider attitudes and beliefs toward a new pharmacy intervention, based on the theory of planned behavior, in a practice-based network (DeMik et al., 2013). Pharmacists were found to score higher than physician

providers on the theory of planned behavior subscales indicating that for chronic conditions such as asthma and hypertension. Implementation of intervention would be more direct from pharmacist view, or they would be more willing to initiate new pharmacy intervention, results also indicating physicians were not disagreeable with the implementation of further pharmacy intervention. Literature suggested the Theory of Planned Behavior questionnaire should be used in physician provider offices without clinical pharmacy exposure to determine the predictive usage of a similar response in these types of offices (DeMik et al., 2013).

TBP concept applies as a model for predicting sedentary behaviors (Prapavessis et al., 2015). Attitude and indirect social norms association and effects were discussed as pertinent to sedentary behavior and perceived behavioral control were considered as being a weak predictor in this study but further discussed was the fact that perceived behavioral control was the only construct not temporal in type. Social norms and intentions in the research were found to have the most robust predictive values for sedentary behavior and the effect of attitude affecting sedentary time through intention (Prapavessis et al., 2015). Further discussed was that there is evidence supporting the use of the TPB to understand sedentary behavior. Study results examining physician intention to counsel on physical activity, in a pilot study, indicated subjective norms and perceived behavioral control were significant in intention to advise patients on physical activity (Behrens & Harbour, 2014).

Jun and Arent (2016) discussed an extension of the TPB concepts by adding prototype and willingness and subdivides attitude to include effective and cognitive and

social norms to include injunctive and descriptive, and expansion of the theory is used to facilitate understanding of healthy eating when dining at casual restaurants.

A continuing education program based on the theory of planned behavior was used to help providers deal with depression management in providing care to diabetic patients (Jun, & Arendt, 2016). Assessment of attitude, confidence, intention, and behavior measurement occur before continuing education program, following continuing education program, and at 6-week follow-up of continuing education program. Attitudes, plans, and confidence about managing depression (Osburn et al., 2010) improved just after the continuing education program. However, short-term changes are not sustainable, and management practice pattern does not alter significantly. More intentions and fewer barriers were found to predict more depression intervention and discussed where health care system barriers were negatively influencing behavior change attempts despite real confidence, attitude, and intention of provider (Osburn et al., 2010).

Research on e-learning focused on social influence to include group control, social identity and social bonds to further understanding of technology acceptance and behavior (Chu & Chen, 2015). Further discussed is that while subjective norms consider explicit others, the influence of the entire group is essential, and that social identity and social bonds are moderating factors of subjective criteria.

The TPB literature findings indicate the TPB can be applied to both dissemination and implementation research and has application to the implementation of clinical practice guidelines for patients with prediabetes and to develop educational interventions for providers.

## Avoiding Diabetes through Action Plan Targeting

Physician advice may impact efforts for behavior change in overweight or obese people with prediabetes (Dorsey & Songer, 2011). An electronic medical record (EMR) applies to many health settings. An automated software solution called Avoiding Diabetes Thru Action Plan Targeting (ADAPT) can enhance the ability of the healthcare provider to identify people with diabetes and prediabetes (Chrimes et al., 2014). Components include a best practice alert, a flowsheet, a bundled order set, patient instructions, progress note, level of service and patient follow-up protocol within the components of the solution (Chrimes et al., 2014). EMR is relative to shared decision-making and clinical decision support with few having integrated modules for clinical workflow and further evaluated avoiding diabetes thru action plan targeting (ADAPT) tool using "near-live" clinical scenarios in shared decision making for behavior change. (Chrimes, et al., 2014).

Other healthcare providers such as nurses may benefit from education to help improve screening for patients with prediabetes (Rairden et al., 2015). Physicians' have also expressed interest in continuing medical education as related to prediabetes care. Curran et al., (2008) suggest that policies that require an increase in guideline adherence may improve diabetes prevention program effectiveness. Dunkley (2014) discussed the need for more research on ways to optimize program efficiency and sustain weight loss and other preventative efforts beyond the short-term range. Research on diabetes suggests that lack of organizational support and technology such as computer tracking may impact continued improvements in diabetic care (Kirkman et al., 2002). Tracking technology may be a reliable tool to track progress and ensure intervention for prediabetes as well.

Continuing medical education or continuing professional development that is theory based may have benefits for increasing uptake of evidenced-based practice and is an important aspect to be considered for continuing medical education activities (Maindal et al., 2014; France et al., 2015).

Literature findings indicated automated software approach may be one approach to facilitate identification of the patient with prediabetes. The software may need to be specific to patient setting and the organization. Provider input into information technology before the implementation and individualized educational needs of providers and other health professionals before software use, to the group, and as applied to specific settings could be developed further in the literature and may impact success with respect to implementation initiatives (Chaudoir et al., 2013).

## Aspects Related to Improving Care

In a review of literature for provider attitude and prediabetes limited information was found. In a study examining provider practice and position toward screening women with prior gestational diabetes for type 2 diabetes mellitus but not for prediabetes, researchers found suboptimal screening led to a lack of opportunity to identify and provide appropriate intervention for these women (Rodgers et al., 2014). The Diabetes Risk Calculator is described in the literature as being a noninvasive screening tool which may be used to detect both prediabetes and undiagnosed diabetes in various practice settings (Heikes et al., 2008).

Prediabetes awareness and practice among doctors in India demonstrated provider knowledge; however, specialist compared to general practitioners were providing regular screening and treatment with lifestyle management or oral antidiabetic medication,

preference for metformin as oral antidiabetic medication (Basavareddy et al., 2015). Basavareddy et al., (2015) study results indicate only 60-70% of the general practitioners screened their patients consistently for prediabetes.

Identification of the patient with prediabetes through screening has been discussed in the literature (Dall et al., 2014). Use of hemoglobin A1C (HbA1c) was presented as having the potential to detect prediabetes or diabetes that had not yet been diagnosed in urban primary care settings (Sohler et al., 2016). A potential benefit to screening for blood glucose above normal range is delay or prevention of diabetes when combined with lifestyle intervention and little risk from screening appropriate individuals (Laiteerapong & Cifu, 2016). Researchers also found both that patients with prediabetes verified and prediabetes not verified had a strong association with the development of type 2 diabetes mellitus when compared to patients with risk factors for type 2 diabetes mellitus (Brunisholz et al., 2016).

The use of HbA1c was not the preferred choice to diagnose type 2 DM in three rural health care systems even though increased use of testing increased, fasting plasma glucose was preferred. Suggested was continuing education efforts to both heighten awareness and use HbA1c as a tool for diagnosis (Kuntz et al., 2012).

Dental point of care screening using hemoglobin A1C had potential to identify diabetic and prediabetes in patients (Franck et al., 2014). Using electronic health record to help improve the accuracy of diabetes disease registries was discussed as having potential both to improve data accuracy and improve quality of care (Liaw et al., 2014).

Cardiovascular disease as related to prediabetes and increased cardiovascular mortality reiterates the value of screening for prediabetes (Huang et al., 2014). Potential

barriers to using risk assessment tool for diabetes in the literature include attitude, tools not being practical for use, lack of support or reimbursement, patients not perceiving the importance of self-screening, and apprehension about the outcome of screening (Dhippayom et al., 2014).

**Clinical Guideline Adherence**

Provider adherence to clinical guidelines for the disease risk factors and patient smoking was relevant in the context of organizational culture (Hung et al., 2014). Corporate culture has predictive value in adherence to clinical guidelines with specific characteristics, such as human resources and performance standards associated with adherence to standards (Hung et al., 2014). The organizational culture within healthcare systems has subsystems to include the individual subsystem, technical and technological subsystem, and functional, structural subsystem interacting within the more massive environmental microsystem (Williams et al., 2016). Intervention within the organization to include the organizational subsystems can increase evidence-based practice adoption. Part of transforming corporate culture requires activation of clinician intentions within the organizational social context and was vital to improve evidence-based practice in health promotion practice such as smoking cessation (Williams et al., 2016).

Barnes et al., (2015) found evidence that even with increased compliance of medical assistants to record height, weight, and body mass index (BMI) primary care providers did not significantly improve diagnosis of obesity or provide appropriate care planning and intervention. Barnes et al. (2015) further suggested that more research is needed to identify organizational culture or other barriers that prevent the

interdisciplinary team from working together regarding obesity-related findings and other interventions.

**Clinical Practice Guidelines**

Utilization of a manual based on evidence-based practice guidelines may improve both the understanding and compliance of health care providers, ultimately improving patient outcomes. (Rosenfield et al., 2013). The utilization of clinical practice guidelines by nurses is affected by internal factors such as attitudes and knowledge and external factors such as resources and leadership (Jun et al., 2016). Active nurse participation in the development of evidence-based guidelines may increase adaptation and continued monitoring of patient outcomes (Jun et al., 2016). The need to build capacity and teaching outside in an unconventional method used a model Teaching Evidence Assimilation for Collaborative Health Care (TEACH). The framework is used to help healthcare organizations and providers learn skills and gain an understanding of evidence-based healthcare but had a more practical use for medium to more extensive facilities and discussed more study is needed (Wyler et al., 2015). Other research looked at change using a case study approach in a health system. Themes found essential for significant clinical difference include preparing clinicians for change, shared leadership, improving knowledge management, opportunities for networking and planned communications as well as providing a clear route through a multilevel system (Best et al., 2016). The additional study suggests that widespread and thorough distribution and implementation approaches increased the likelihood of successfully implementing new guidelines in settings without a lot of resources (Chimeddamba et al., 2015).

Evidence from the research showed the importance of evaluating the sustainability of directives and characteristics related to the viability of guidelines, once guidelines were put into place (Fleiszer et al., 2016). Evidence-based tools and ideas for facilitation of evidence-based practice by nurses and clinicians were applicable to providing consistent quality care and have potential to improve patient outcome (Dyal et al., 2016). Another tool discussed in research is the standardized clinical assessment and management plan (SCAMPs) which were described as potentially being a preferred choice compared to clinical practice guidelines (Farias et al., 2013). Development of SCAMP, resource use, the inclusion of stakeholder interest as well as care improvement and alternative as usage to clinical practice guidelines are applied (Farias et al., 2013).

**Provider and Improving on Adherence to Guidelines**

Evidence in the research reviewed trends of the management and knowledge awareness for managing patients with type 2 diabetes mellitus with different kinds of providers suggested that while there were changes compared to study in 2011, there were marked gaps in insight, awareness and understanding, and practitioner management. There is a need for education to address some of these deficiencies and a necessity of pharmacist education on glycemic objectives (Williamson et al., 2014).

The need for evidence-based research to help narrow the gap between knowledge and practice about chronic disease management and increasing adherence to clinical and to screening guidelines is described in the literature (Bodenheimer, 2003). Schwaiger et al. (2013) discussed increasing adherence to cervical cancer screening and the need for quality improvement projects as pertinent to clinical practice and evidence-based care. Researchers used a pre-intervention survey with a chart audit then provided an

educational session to include the use of both a computer module and a pocket guide followed by a post-intervention survey and chart audit following the intervention. Small sample size and one location were study limitations, however, did demonstrate a significant increase in guideline-consistent cervical cancer screening in this setting (Schwaiger et al., 2013). The difficulties of behavior change and need for continuing intervention is needed to improve quality of care (Velez et al., 2014). Walters et al., (2014) examined provider preferences for guideline intervention in the emergency room and found a brief, decisive response and need for appropriate resources available for follow-up.

**Approaches to Improve Quality of Care**

Paths toward improving quality of care relative to a variety of topics were in the literature. Research examined both adherence to a protocol for opioid management and attitude toward patient management that utilized an electronic medical record protocol to improve accession was described (Canada et al., 2014). Physician and staff knowledge, as well as adherence, were assessed using pre-and post-intervention survey, adherence, and learning had significant improvements (Canada et al., 2014). A quality improvement initiative relevant to cervical cancer screening guidelines as described in the literature involved five steps. Steps included provider survey, record audit, education, and provider re-survey, followed by additional medical record audit (Schwaiger et al., 2013). An extra or reinforcement educational session potentially impacted results. The researcher further discussed that the provider satisfaction survey results indicated increased satisfaction with the pocket guide compared to the computer module (Schwaiger et al., 2013). Patient effect and ongoing quality improvement as guidelines are updated are discussed as

important aspects to consider for quality improvement. Magnan et al. (2015) presented the number of medical conditions we have instructions for and assessed other conditions that may or may not be part of diabetes care, considered the development of guidelines for multiple diseases and intervention for the same (Magnan et al., 2015). Many health conditions, such as rheumatoid arthritis, are discordant to diabetes by practitioners in this study, however, may increase the risk of cardiovascular disease and require blood sugar, lipid, and blood pressure control similarly to diabetes (Magnan et al., 2015). Electronically crossing guidelines for multiple conditions, focusing on the interaction between states, having less disease-centric directions and integrating care goals may help improve care (Magnan et al., 2015).

One researcher focused on using a tool focused on practitioner knowledge and behavior change specifically toward obesity (Gance-Cleveland et al., 2009). Discussed was the lack of expertise reported by nurse practitioners to manage preventative and treatment aspects of pediatric obesity. A tool was adapted from an original instrument designed to assess provider practice, behaviors, and barriers related to overweight prevention in youth. A pre-test, post-test survey method was used, an intensive workshop described the educational process used for healthy eating and activity together (HEAT) clinical practice guidelines (Gance-Cleveland et al., 2009). Practitioner knowledge, plan to change practice behavior, and strategies for dealing with barriers were shown to improve. The need for further study to further evaluate training relative to provider behavior to include motivational interviewing and patient outcome is needed (Gance-Cleveland, 2013).

Caruso et al., (2007) discussed quality care improvements relative to elder urban population outcomes pertinent to diabetes mellitus and cardiovascular disease. Baseline demographic, medical data and clinical measures were from previously published guidelines; data was collected from paper and electronic health records (Caruso et al., 2007). Interventions consisted of the review of evidence-based clinical guidelines at meetings with providers, provision of provider report card, display of materials for self-management of cardiovascular disease and diabetes mellitus on bulletin board, signs for patients, and information about disease and self-management to patients. The implementation of the electronic medical record change facilitated provider documentation. The chronic care model interventions were shown to promote improved quality of care in the study population (Caruso et al., 2007). Bodenheimer (2003) discussed the chronic care model and the need for further study to determine which parts are most beneficial, cost-effective, to consider illness and setting, to bridge the gap between knowledge and practice.

Cost-effectiveness and clinical practice guidelines have the potential to provide increased value for money and show the importance of building in cost-effective analysis into an intervention (Garrison, 2016). Using tools and resources for patient care that are pertinent to more than one disease state in different types of healthcare systems was discussed (Manca et al., 2015). Research examining adherence to other medical problems addressed decision support tools, communication, review of records, and pharmacy backing were significant in improving management of asthma, using clinical guidelines (Okelo et al., 2013). Assessing and implementing systems thinking was found to ensure guideline implementation at multiple levels (Best et al., 2016).

Evidence found in the literature suggested the diabetes nurse educator skills may apply to people with prediabetes (Sherr & Lipman, 2013). The scope of and standards of practice for diabetes educators may include assessment and care provision for people with prediabetes; however, practice options may overlap, and other disciplines may also be certified as diabetic educators (Martin et al., 2005). Extraprofessional education is discussed as a best practice model for training and applies to the healthcare system (Bridges et al., 2011).

**Considerations for Screening and Education**

Multidisciplinary or interprofessional teams may need to be involved in both detection and an educational process for professionals and patients. In other diabetes research, discussed is the significance of having patients, providers and health systems working together and productive communication between researchers and policymakers to help ensure evidence-based practice (De Quevedo et al., 2012). In addition to lifestyle, pharmacotherapy may benefit some individuals to help reduce the risk of development of type 2 diabetes mellitus (Alan, 2015). Involving community, using community strategies to help with the implementation of lifestyle management are also discussed and may benefit to help implement changes needed to reduce the risk of type 2 diabetes mellitus (Dodani & Fields, 2010; Scarpello et al., 2011; Tapp et al., 2013).

Literature findings indicated that quality improvement is multifaceted. There are clinical guidelines for people with prediabetes as well as many other health conditions. Provider adherence and utilization of instructions may vary. Developing an evidence base is one of many factors relevant to closing the gap between knowledge and practice. Quality improvement was discussed in the literature as applied to various health

conditions, but there was limited information for prediabetes in the context of a more extensive health care system.

## Summary

Improving screening and identification of people with prediabetes is necessary to provide appropriate intervention to delay or to prevent the progression from prediabetes to diabetes, when possible. There are recommendations in the clinical guidelines for providing care to these patients. Clinical guidelines have inconsistent adherence. Organizational culture and teamwork may benefit within the healthcare setting to implement appropriate intervention (Korner et al., 2015). Due to individual and cultural differences, it may be necessary to first perform changes in an area before more substantial scale change and care integration (Ko et al., 2015). Intervention for organizational change may need to target many different aspects within the organization for improved effectiveness (Towne et al., 2015). Practitioner level characteristics and beliefs may equally impact organizational change (Kim et al., 2015). The theory of planned behavior was one framework that may be used to understand provider behavior and may be used as formative research to help inform future intervention. Provider attitude, provider perception of peer belief, ease or difficulty of behavior, intention, and actual behavior are part of the TBP and have been studied in other areas of health practice, such as substance-abuse provider communication (Roberto et al., 2014). Further research using medical record data to determine what treatment providers are providing for people with prediabetes in the health system may benefit. It is also essential to understand what provider attitude and needs are as well as their understanding of how patients with prediabetes should be managed to reduce the risk of development of type 2

DM. The purpose of this mixed-method study was to fill a gap in the literature by seeking to provide evidence of the provider practice and attitudes when implementing ADA practice guidelines when treating the prediabetic patient

# Chapter 3: Methods

## Introduction

The risk of development of type 2 DM was higher for people with prediabetes than for people with normal glucose tolerance, and there were up to 79 million people in the United States with prediabetes (Albright & Gregg, 2013; CDC, 2011). Prediabetes is a stage between having a higher-than-normal serum blood glucose but not high enough to be categorized as diabetes mellitus. The problem is prediabetes signifies an increased risk of developing diabetes and is a problem in the United States (Aroda & Ratner, 2008; Harris et al., 1992). Practitioners who educate people about prediabetes were not consistently using the latest evidence-based practice guidelines (Hooks-Anderson et al., 2015).

Preventative interventions may reduce or delay diabetes development in some people and reduce complications for those who do not develop diabetes mellitus (Boyle, 2010; Diabetes Prevention Program Group, 2009, 2015). Diabetes Prevention Program lifestyle intervention has been shown to be useful in the primary care setting (Ma et al., 2013). Increasing identification of people with prediabetes in primary care was vital to decrease the risk of development of diabetes and associated problems (Rattay & Rosenthal, 2014). Provider intervention, attitude and behavior may vary by provider specialty (Anderson et al., 2015; Basavareddy et al., 2015).

To understand provider experience and similarities in beliefs or barriers that support or do not support implementing recommended standards for care for people with prediabetes qualitative data from providers along with quantitative data may enhance understanding of current care provision for people with prediabetes.

The Theory of Planned Behavior (TPB) is one framework that has been used to study both provider intention and for dissemination and implementation research (Behrens & Harbour, 2014; Burgess et al., 2016). Attitudes, subjective norms, and perceived behavioral control as part the TPB were used in the interview process to facilitate an improved understanding of evidence-based practice for youth evidence-based training in mental health (Burgess et al., 2016). The TPB components were appropriate to promote enhanced understanding of evidence-based practice as part of dissemination and implementation research. Similarly, the TPB components are used to facilitate understanding of dissemination and implementation research as applied to the clinical practice guidelines for people with prediabetes to include the medical provider and other health care professionals.

## Hypothesis

For the quantitative portion of the research, it was hypothesized that health care providers in Florida report using interventions in practice that suggest a higher rate of compliance with the ADA clinical practice guidelines than the national average for patients with prediabetes. The research question for the quantitative portion of the research was:

1. Do primary care providers in Florida report using interventions in practice that suggest a higher rate of compliance with ADA clinical practice guidelines for prediabetes patients as compared to the national average?

$H_O1$: Health care providers in Florida report using interventions in practice that do not suggest a higher rate of compliance with the ADA clinical practice guidelines than the national average for patients with prediabetes.

$H_a2$: Health care providers in Florida report using interventions in practice that suggest a higher rate of compliance with the ADA clinical practice guidelines than the national average for patients with prediabetes.

## Research Design and Rationale

Criteria that were considered when selecting research design include research problem, individual experience, and audience (Creswell, 2009). All methods have limitations and to view the full range of data collection possibilities if both qualitative and quantitative data collection contribute to the understanding of the research problem; a mixed method approach is used (Creswell, 2009). Method of collecting types of data, in stages or concurrently, the weight of data type, mixing and data interpretation, and theoretical perspective are integral components in the choice of procedural design for mixed method research (Creswell, 2009). Combined method research may be used to both foci on quantitative based research questions such as describing correlations or prevalence rates and qualitative based issues like personal insights and experiences (Frels & Onwuegbuzie, 2013). One primary objective of this project was to access and analyze data that relate to improving care for the patient with prediabetes.

Six strategies defined by Creswell (2009) for the design of mixed-method data inquiries are the sequential explanatory approach, sequential exploratory strategy, the sequential transformative strategy, concurrent triangulation strategy, concurrent embedded strategy, and concurrent transformative strategy. The concurrent triangulation strategy applied to this study.

My overall design for my project was mixed method; using a systematic process to determine the reported rate of compliance reported with ADA clinical practice

guidelines, self-reported attitudes, and behaviors of providers. Data was examined to determine differences in attitudes and barriers for those providers that reported using the standards for people with prediabetes compared to those providers that reported not using the guidelines for people with prediabetes. For the quantitative part of the study, provider reported behavior, using the questionnaire process was recorded for provider practice for people who meet the ADA diagnosis guidelines for prediabetes, with data collected to see what treatment (s) are occurring for people with prediabetes. It was necessary to obtain quantitative data for a baseline description of what is happening to patients with prediabetes in the healthcare system. The quantitative data was vital as part of the quality improvement process for the patient with prediabetes. The research questions for both the quantitative and for the qualitative methods were previous stated.

No personally identifiable information was viewed as part of the data collection process and reported data was in aggregate form. Consent forms were on the first page of the anonymous survey link with no names recorded as part of the data file. The dependent variables for the quantitative portion of the study were evidence of provider reporting the intervention for patients meeting ADA criteria for the diagnosis of prediabetes, counseling regarding weight loss and physical activity documented reported by provider. Providing counseling and advice to facilitate weight loss and increased physical activity and initiation of medication to lower blood glucose levels were additional dependent variables. The independent variable was the provider or health care professional.

The phenomenon of interest was care provided for the patient with prediabetes and included provider and health care professional behaviors and underlying attitudes and behaviors concerning the implementation of recommended clinical practice guidelines for

patients with prediabetes including the provider's perspective and experience. Obtaining both objective data and qualitative data to include health care professionals experience helped provide evidence for informing interventions and optimizing care to improve care for the patient with prediabetes in the health care system. The purpose of this mixed-method study was to fill a gap in the literature by seeking to provide evidence of the provider and health care professionals practices and attitudes when implementing ADA practice guidelines when treating the prediabetic patient.

One other mixed method approach described by Creswell (2009) include sequential exploratory strategy which provides for qualitative data collection followed by quantitative data to build on the results; this procedure was not chosen as part of this study as I did not plan to develop a new instrument to use in this study.

Quantitative data was obtained, for this study, using questionnaire and non - experimental design for descriptive purposes. Along with the questionnaire as part of the data collection process, additional information from health care professional providers concerning their attitudes and behaviors when treating  people with prediabetes was collected. My role in the quantitative data collection process as a researcher was first to identify via data provided from health care professionals what interventions are implemented in practice using self-report.

In qualitative research, the researcher also serves as an instrument (Creswell, 2009). Recommendations when reporting qualitative research are researcher characteristics to include relationship and interaction that have potential to influence research to be published (O'Brien et al., 2014). Researcher traits were in the study results. Other recommended standards for reporting results were considered.

## Data Collection Procedure Rationale

Characteristics of the population for the project included people who provide care to people with prediabetes in Florida. Medical providers and health care professionals were adults. Participants in the study included physicians, registered nurse practitioners, advanced practice nurses, physician assistants and other licensed health professionals who provide care to outpatients in Florida. No data collection occurred until there was approval from the Institutional Review Board (IRB) at Walden University.

A sample definition is any subset of sampling units taken from the population (Frankfort-Nachmias & Nachmias, 2008). When a list of the sampling population is not available, non-probability sampling may be used and was also appropriate for exploratory research if convenience and cost outweigh probability sampling (Frankfort-Nachmias & Nachmias, 2008)

Determining sample size needed population size, if known, confidence interval and confidence level are necessary. Population number was not known for planned quantitative part of this mixed method project. It was determined a minimum number of 385 participants for the questionnaire were needed, using confidence level of 95%, margin of error of 5 and unknown population size. Two main designs were considered for non-probability sampling methods and include convenience sample and quota samples (Frankfort-Nachmias & Nachmias, 2008). Convenience samples selected from sampling units conveniently available; however, it is not possible to estimate population using this type of sample (Frankfort-Nachmias & Nachmias, 2008).

Quota sampling is done to help replicate characteristics of the sample population and may include such items as ethnic origin and or gender. This method of sampling was

not appropriate for current research study as while there was general knowledge of gender, more male than female, other characteristics were not available. For the quantitative sample strategy as part of this mixed method study, convenience sampling was used.

Different approaches and methods that are useful for qualitative studies. Procedures include ethnography, grounded theory, narrative, case study or phenomenological approach. The ethnographic approach seeks to understand the culture of a group of people (Patton, 2002). Grounded theory approach is a plan to see what theory emerges from comparative analysis and narrative method is used to understand the life story of the person (Patton, 2002). A case study may provide an in-depth review of a case or extreme case (Patton, 2002). The Phenomenological approach is an approach to understanding the lived experience of a person or group of people and was the approach for understanding provider experience as the qualitative component of this mixed method study. The phenomenological approach seeks to understand the lived adventures of a group of people, and while there were many considerations in using this approach, it was used to understand health provider experience, such as for nurses (Quinney et al., 2016). The provider's perspective and health professionals lived experiences provided additional data that was not able to be obtained objectively, and a phenomenological approach was an approach that was useful for this part of the data collection process.

## Participation and Data Collection

Data from providers and health professionals documented preferences and reported care provided to the patient with prediabetes. Questionnaire data was collected via anonymous survey link (Appendix A). The informed consent was included as the first

page of the questionnaire accessed via anonymous link. Health care professionals who desired to participate were provided an informed consent form to document their participation was entirely voluntary, and they may choose not to join or to discontinue participation at any time. Interview data was collected by phone anonymously for those who chose to participate in the interview portion.

## Instrumentation

One type of data collection tool used was a questionnaire form to document care given to people with prediabetes like one used in a prior study. The form included other types of lifestyle management guidance from the provider (Appendix A) and interview data (Appendix B). Open-ended questions were part of the interview process. Theory of planned behavior has been used to increase the understanding of the health professional intention toward the use of clinical guidelines (Kortteisto et al., 2015). The theory of planned behavior was used as a framework for understanding evidence-based context for youth and mental health practice (Burgess et al., 2016). Burgess et al. (2016) discussed some open-ended questions that were used to understand evidence-based practices and youth better. These items may apply to this study, for example, providers were asked to identify what advantages or disadvantages there are for using clinical practice guidelines or what patient outcomes might be if they provide lifestyle counseling for a person with prediabetes. Demographic data such as age range, gender, number of years they have practiced and specialty area of practice if applicable, was obtained from providers who participated in qualitative interviews for the study. Sampling, number of participants, for this phase of the study was in process until there were no new themes are emerging from the data or data saturation is reached (Taghizadeh et al., 2015).

## Data Analysis Procedures

Statistical analysis using both inferential and descriptive statistics were completed for quantitative data using SPSS and described to include a visual representation of data such as the use of graphs (Frankfort-Nachmias & Nachmias, 2008). Qualitative data was reviewed, and hand coded for themes and then the word transcripts were uploaded into NVivo to determine if auto coding revealed any new themes.

## Reliability and Validity

Reliability refers to the consistency of the measuring instrument and validity relates to instrument measuring what is in intended to measure (Frankfort-Nachmias & Nachmias, 2008). In qualitative research, qualitative validity means the accuracy of findings is checked by the researcher using specific methods, and qualitative reliability refers to consistent research approach (Creswell, 2009). Trustworthiness use and dependability, and views of evaluator and stakeholder are part of validity in qualitative research; content, internal and external validity need consideration (Zohrabi, 2013). An example for content validity as applies to current study might be having an expert review the interview guide, and if question inappropriate it may not be used. Long-term observation, peer review, including participants in various stages of research and disclosing research bias may help facilitate internal validity. Considering research design to be able to apply research findings to other settings is essential for external validity (Zohrabi, 2013). Describing research is a crucial consideration for reliability as well as rationale and reasons for choices, triangulation using different procedures and data collection methods may help to increase reliability (Zohrabi, 2013). Using various ways to compare data from methods was used for this study.

## Ethical Considerations

Ethical procedures deserve consideration throughout the entire research process (Creswell, 2009). Obtaining agreement of those who are in authority and appropriate consent are ethical considerations for study (Creswell, 2009). For this research project proposal approval forms are required to be signed by Walden University, approved by Walden IRB prior to data collection. Creswell (2009) discussed privacy of all persons interviewed as well as obtaining appropriate informed consent as of ethical procedures and need consideration for the prospective study. Retention time for data and who owns the data are additional ethical considerations (Creswell, 2009). No personally identifiable information is for reporting, and all data collected will be kept secure as part of the ethical procedure.

No personally identifiable information was used as part of the data collection reporting process. The consent form was included as the first page of the anonymous survey link. Paper interview forms are in a locked cabinet in a locked room, and data on computer documents kept in a computer locked by password with no individual identifiers. Only aggregate data and no personally identifiable data was in reported results.

Data on what interventions are reported for treatment for people with prediabetes within the healthcare system and increasing understanding of provider experience, attitudes and behaviors for people with prediabetes within their practice setting may provide evidence for future intervention, to help reduce risk of development of type 2 DM for people with prediabetes and improve care for the patient with prediabetes in this setting.

# Chapter 4: Results

## Results and Findings

Following IRB approval number 04-02-0223824 the survey was sent via email or invitation, anonymous survey link to health care professionals in Florida, contact information was provided to respondents on how to anonymously contact researcher if they would like to participate in the interview process after survey completion. Informed consent was included as the first page after accessing survey link and respondents were free to close the link and not continue if they chose not to do so after reading the consent. Contact information for researcher and for Walden IRB was provided in the consent form for any questions the potential participant may have. Participants were able to answer questions they chose to answer and were able to discontinue participation at any time.

Once questionnaire survey responses were completed SPSS was used to examine inferential and descriptive statistics that relate to use of the American Diabetes Association Standards of Care (ADA, 2021). Screening is recommended in the American Diabetes Association Standards of Care (ADA, 2021). Results did not support that the health care providers in Florida exceeded the national average in guideline adherence based on following the recommended screening guidelines.

A one sample proportion test with confidence intervals for screening was not significant at the <.05 level and was 1.22 percent less than the hypothesized population mean, 95% CI [.494, .587].

**Additional Exploratory Analysis**

Response to the question for routinely screening and for having preference for treatment for prediabetes was completed by participants (n=410), the proportion answering no to the question (183/410) or 45%; the proportion of those answering yes to the screening question and preference for treatment was (227/410) or 55%. A crosstabulation was completed for the question for do you routinely screen for prediabetes and the selected preference of treating prediabetes, preferences for treating prediabetes included diet and exercise (lifestyle modification, LSM), oral antidiabetic drug (OAD), and combined therapy (LSM and OAD). There was not a significant difference found for preference for treatment preference and whether there was routine screening for prediabetes, $X^2$ (2, n=410) = 2.05, p >.05). Health care providers who reported having prescribed any OAD for prediabetes compared to those who had not prescribed an OAD for prediabetes were compared for concern of hypoglycemia in treating prediabetes; there appeared to be a statistically significant association $X^2$ (1, n=384) = 6.3, p < .05); the concern for hypoglycemia may need to be further explored in the context of screening and providing care to patients with prediabetes. Medication preference for those providers that reported prescribing medication (n= 83) was analyzed, Metformin was first in order of preference (66/83) or about 80%, Sitagliptin was second in order of preference (13/83) or about 15% and Voglibose third in order of preference (4/83) or about 5%, $X^2$ ( 2, n=83) = 81.1, p < .05). Age group a provider would want to screen for prediabetes in both those who screen routinely and for those providers that do not screen routinely was analyzed, there did not appear to be an association between those who screen and those who do not report routinely screening for age they would

want to screen or for the youngest age of patient by age category. For the age group 35-45 years, (65/197) or about 34% of providers who do not routinely screen would want to screen in this age group, and for providers who reported screening (79/234) or about 34% of providers would want to screen in the 35-45 year old age group, relatively small percentages of providers who report not currently screening would want to screen in the age group > 65 years (7/197) or about 4%; for providers who do report routine screening (9/234) or about 4% would want to screen in age group > 65 years. ANOVA was not completed for screening compared to no screening reported for age group and youngest age of person seen in the practice. The boxplots are shown in Figure 1 and Figure 2.

**Figure 1.**

*Comparison of Age Groups for Providers Reporting No Screening*

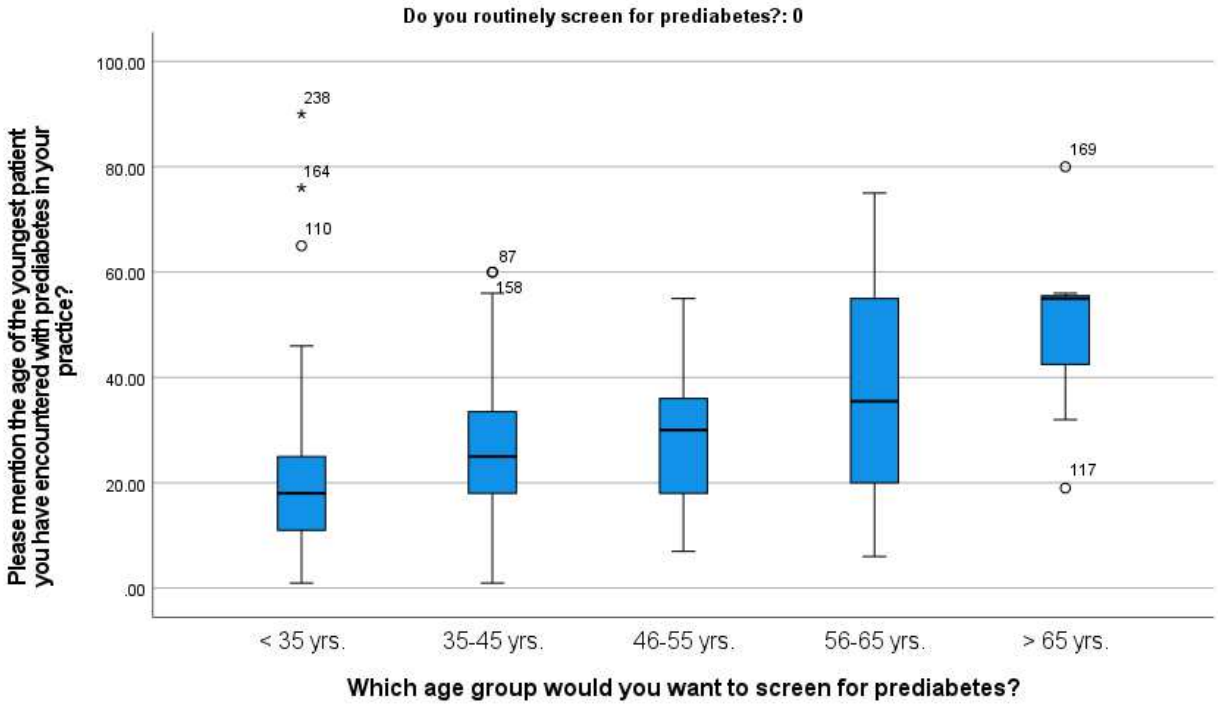
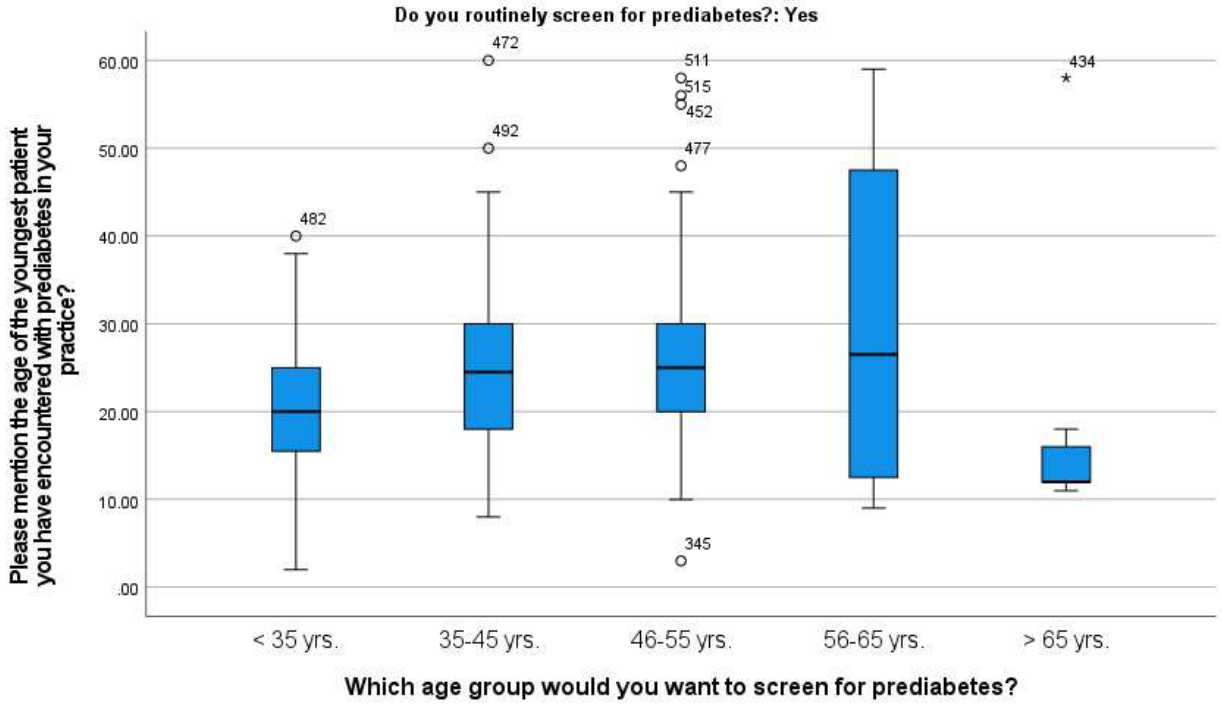


**Figure 2.**

*Comparison of Age Groups for Providers Reporting Screening*




## Qualitative Results

After the descriptive statistics were analyzed in SPSS, the interview transcripts (n=5), were reviewed and coded for themes, initially interviews were coded by hand. Once coded by hand interview notes were typed into a word document and both hand and auto coding were used in NVivo, along with coding word frequencies were used. The question about dietary advice from providers that was on the questionnaire was also uploaded into NVivo to examine for themes. Attitudes and barriers related to the usage reported for standards of care or to the lack of usage reported for the standards of care were reviewed to try to enhance understanding of the usage of standards of care by providers, from the provider perspective. Three of the providers reported more favorable

attributes in the use of the guidelines compared to the two other providers. One attitude from the responses appeared to be related to the trust or belief in the standards of care. For example, one of the providers reporting favorably for use of the guidelines stated, " I think the standards of care and comprehensive and have good detailed useful information to use when providing care" and "I have confidence in the standards of care". One of the providers with less favorable use for the standards of care stated, "I have looked at them, they have useful references, I can't say I strictly use them, but may refer to them" and "They may be useful, but not in all situations". Another commonly recurring theme was regarding individuality or uniqueness more in the context of patient but also in context of provider. An example of the individuality from a provider that reported favorably with respect to the usage of the guidelines was " I think it is equally important to remember individual patients and their health history when using standards of care"; another provider stating, "every person is different". A provider with a less favorable view of the standards of care stated, " I don't believe they relate much to clinical judgement, guidelines may be useful, but you need to consider individual patients and use your judgement". Individuality was also viewed as a barrier; one provider said, " For barriers, I would say time and individual patients, some especially where I work take a lot of time and have difficulty understanding" and another stated "Individual patients may not agree with guidelines so I guess you might sometimes say patient preferences". Another aspect related to usage of guidelines that was brought up related to a summary or easy to use format. This was discussed by both providers who had more favorable views and by providers who had less favorable views. Examples of a summary theme include "There are a lot of details". "I find the summary/charts useful" and "Useful information in a

condensed form, easy to understand how applies to different types of patients". Education and skills both related to provider and to patient was a recurring theme. An example from a provider with favorable views of the guidelines was " I may need additional education to keep up with the standards as they change". An example with respect to the patient was "education earlier may help some" and "helping people understand what to do to prevent, if possible". A provider with less favorable view stated, " I don't usually do much with teaching but refer them to a nurse in our clinic to help get them what they need".

One potential barrier reported by both providers who have more favorable reported usage of guidelines and less favorable use of guidelines was time more specifically related to education for providers with more favorable usage of guidelines reported. An example of this was " I spend as much time as I can with people but would like an easy way to help them get to or have follow-up education"; a provider with a less favorable view of using the standards stating, "For barriers, I would say time and individual patients". Provider skills appeared to be related to impact from the provider aspect one provider stated, "clinical judgement is vital whether using standards or providing care." Another provider with a less favorable view of standards stated, " I don't believe they relate much to clinical judgement, but you may need to consider individual patients and use your judgement". Providers interviewed referenced work when discussing the theme of clinical and standards, for example, "We have guidelines at work and I am also responsible for keeping and reporting data"; "I am expected to follow guidelines", and another provider with a less favorable view of the standards of care relayed that "we have guidelines that we generally use and are monitored for certain

documentation". These statements appeared to suggest the work environment or norms were related to guidelines and expectation of certain documentation of criteria established in the work environment.

Dietary advice from the questionnaire was also analyzed for themes, most frequent advice provided centered around exercise, carbohydrate to include eating less, portion control, controlling the amount, another theme was eating less sugar and consuming less sugar in drinks to include drinking more water, eating healthy foods increasing vegetables and fiber was included in advice provided. Other advice provided by very few participants included recommending adequate sleep and not smoking.

The American Diabetes Association Standards of Care (2021) include recommendations for clinical practice that are pertinent to prediabetes. One recommendation includes referral to an intensive lifestyle behavior change program focused on losing 7% of body weight and increasing moderate physical activity to at least 150 minutes a week. Current criteria for defining prediabetes may include FPG 100 mg/dL to 125 mg/dL or 2-h PG during 75-g OGTT 140 mg/dL to 199 mg/dL or A1C 5.7-6.4%. Screening for prediabetes and for type 2 diabetes risk with an informal assessment or an assessment tool is recommended to guide providers for further diagnostic testing, as noted in the standards of care published by the ADA (2021). It is also suggested metformin therapy be considered in prediabetes particularly for those with BMI greater than or equal to 35 $kg/m^2$, people < 60 years of age and women who have previously had gestational diabetes mellitus and there is a recommendation to monitor for B12 levels if metformin is used long-term.

Screening for prediabetes was reported to be completed by more than half about 55% of the health care providers completing the questionnaire. There is a variety of reasons they may not report screening, one reason may be that it is not part of their role, in other words someone else in the work setting may be completing screening. Another reason is that some providers may not view screening as an informal risk assessment, screening may need to be further defined. The preferred medication by most providers completing the questionnaire was metformin. Dietary advice while not as specific as recommending the 7% weight loss or the 150 minutes of moderately intense physical activity was focused on advice that would recommend exercise and increased physical activity and advice that would likely allow for weight loss. Most providers focused on wanting to screen in appropriate age group ranges. Only a few recommended screenings for prediabetes at older age ranges, however, it is possible that these health care professionals may work with an older population.

To enhance understanding of some of the differences in attributes for providers that report using clinical practice guidelines or standards of care for diabetes or prediabetes some of the themes that are relevant to practice were reviewed. A table with a few of these themes and differences based on attribute considering components of the TBP are as in Table 2.

**Table 2.**

*Examples of Theme comparisons from Favorable/Less Favorable Provider Perspectives*

| Theme | Favorable | Less Favorable | Attitudes | Barriers | Norms |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Standards, Clinical Guidelines | X | | Positive, confident, intention to use "I think the standards of care are comprehensive and have good detailed, useful information to use when providing care" | Time differences, amount of information "Barriers may include time and sometimes differences in guidelines and the amount of information that accompanies the guidelines" | Expected to use at work performance "I'm not sure but I believe others in my work environment are expected to follow basic standards of care" |

| | | | | | |
|---|---|---|---|---|---|
| Standards, Clinical Guidelines | | X | Uncertainty, lack of familiarity "I am not sure I am familiar with the American Diabetes Association Standards of care, but we have guidelines we use at work that we are expected to use" | Time, Educational needs " One barrier is time"; "as guidelines change it takes time to keep up to date" "Education having shortened versions in ways easy to refer to helps me" | Work related " Most people I work with use guidelines to some degree that are provided at work" |
| Patient Quality or Uniqueness | X | | Accuracy, population based " I believe it is important to | Education, remembering "Understand the guidelines change over | Use of ADA Standards and others at work " I do use the standards; I may also use references |

| | | | | | |
|---|---|---|---|---|---|
| | | | include how the standards relate to specific populations" "I think it is equally important to remember individual patients and their health history' | time; I also think it is important to have tables or charts that help provide a summary to help me remember specific guidelines | or guidelines provided by the organization I work for" |

| | | | | | |
|---|---|---|---|---|---|
| Patient Quality or Uniqueness | | X | | Unsure about standards as related to quality but consider individual qualities "They may help to some degree, but there is much more than guidelines to consider when trying to help a patient such as their background complete medical history and | Work related quality measures at work "We have guidelines that we generally use and are monitored for certain documentation" |

| | | | | | |
|---|---|---|---|---|---|
| | | | | social situation” | |
| Screening | X | | Individuality, self - management “Helping patients understand how to manage or to decrease risk” | Human resources, time “Having an adequate amount of time and other team members or | Social/organizational norm “ I do use the standards of care when I provide care to my patients” and “others in my work environment expect me to follow basic standards of care” |

| | | | | | |
|---|---|---|---|---|---|
| Screening | | X | Not responsible for<br><br>"I provide limited screening but may refer them" | resources for follow-up"<br><br>Human resources/staff<br><br>"Having specific people assigned to help with those items" | Unclear expectations-<br><br>"They may be referred to more often by some providers" |

There were some differences in attitudes and barriers for providers who report using the American Diabetes Association Standards of Care and those who do not. There were also some similarities in comparisons for providers who use and do not report using the American Diabetes Standards of Care but may use other work-related guidelines or evidenced based practice guidelines from the literature. Providers who report using the guidelines seem to have trust in the evidence base of the guidelines, providers from both those who report more favorable use and less favorable use references that have shortened versions and ways to remember the guidelines beneficial. Individual needs were referenced in interviews for both types of providers; in one interview with a less favorable view of the guidelines provider individual consideration appeared to be more of

a theme than patient individual consideration. It appears in work settings where the standards are used there may be additional guidelines that are part of the organization that may be used in addition to the American Diabetes Association Standards of Care. One of the providers with a less favorable view of using the standards of care relayed that there may be too many guidelines. Education for patients and ongoing education for providers was a recurring theme, time was cited as a barrier in both groups. Experience, education, continuing education and work-related resources were cited by one provider who reported "not necessarily" using the American Diabetes Association Standards of Care. Individuality was a recurrent theme and appeared more specific to patient education and screening for the 3 providers that reported more favorable use of the American Diabetes Association Standards of Care. Patient outcome or impact of usage of the standards was mentioned and in the context of being both beneficial or not beneficial based on how they are used and considering patient individuality.

Researcher traits included researcher is a dietitian as disclosed on the informed consent, other traits include limited research experience, an adult student, and has experience working with patients to include diabetic patients and experience working with other healthcare professionals.

Triangulation of data is one way of integrating findings in mixed methods research (O' Cathain et al., 2010). One form of triangulation may be using different research methods. The intent with respect to this study was to use both quantitative and qualitative methods to have a more comprehensive way to look at prediabetes awareness. In this sample of providers, some providers reported screening people for prediabetes and some providers did not report screening for prediabetes. As previously discussed, this

may be related to a variety of factors. It is possible based on the qualitative findings from this study that attitudes and barriers or perceived barriers could play a role in whether providers do or do not screen for prediabetes.

One similarity considering both the quantitative and qualitative data was that 55% of health care professionals reported screening for prediabetes and for the qualitative portion 60% of the healthcare professionals appeared to have more favorable views of the American Diabetes Association Standards of Care. Diet and Exercise (lifestyle modification-LSM) was the most preferred treatment for prediabetes, regardless of screening status. The association of concern of hypoglycemia and prescribing of medication for patients with prediabetes is of interest and the concern may need to be further explored. The age group healthcare professionals would want to screen for prediabetes did not show a significant association based on screening status. Trust or belief in the standards in the context of providers who did not report favorable use of the standards is of interest and may need to have further study with respect to health care professionals who report screening compared to those who did not report screening. In the qualitative portion, one provider who did not report as favorably on the standards of care verbalized they may refer which is consistent with the standards of care, in the quantitative questionnaire referral to an expert was not a frequent occurrence when listing advice they would provide but did occur, however, more frequent advice was given for changes in diet and exercise that would likely lead to weight loss, however, the idea of referring to someone more expert did occur both for the qualitative and for the quantitative portion of this study. Teaching with respect to patients was important for healthcare professionals reporting more favorable usage of the standards of care in the

qualitative portion, however, in the quantitative portion of the study appropriate diet and lifestyle advice was provided regardless of screening status reported by healthcare professionals suggesting that the underlying knowledge is there although it is not known how advice may be used by health care professionals with less favorable compared to more favorable use of the standards of care. Time was a consideration mentioned by both health care professionals who report favorably and those who do not report favorable usage of the standards of care. It is not known for providers not currently reporting screening whether time is or may be a consideration for the time it takes to screen or not. Work related guidelines in addition to or as part of the ADA Standards of Care may be a consideration, in other words for those healthcare professionals referencing work related guidelines, the framework or development behind the work-related guidelines is not known and may have been developed based on the ADA or other referenced based guidelines. Trust in work-related guidelines compared to the standards of care for healthcare professionals reporting less favorably about the standards of care may be important to consider in quality care initiatives. Norms, as a component of the TPB, especially work-related norms may be an important factor to consider when implementing prediabetes awareness initiatives within the context of quality initiatives and guideline implementation.

# Chapter 5: Interpretation of the Findings

## Discussion, Conclusions, and Recommendations

Quantitative data from the survey questionnaire was analyzed in the context of provider self-reported preferences for prediabetes, the purpose of the questionnaire was to provide additional information about provider practice in comparison with the American Diabetes Association Standards of Care, the most recent version published was from 2021. Ideally it was originally planned to have some in person contact or direct observations, however, due to COVID-19 and to factors prior the project had revisions and subsequent approval of procedures to complete the project in a virtual versus in person context. Data from the survey questionnaire was described in the results section. More than one-half of the providers answering the questionnaire reported screening patients for prediabetes, provided dietary advice while not as specific as the standards that would relate to helping patients lose weight and increase physical activity, providers who reported prescribing medication preferred metformin and appropriate age groups were chosen for screening. The American Diabetes Association uses a grading system for the standards of care (ADA, 2020). Grade B evidence is described as evidence that supports the guidelines and comes from cohort study, registry, case-control or meta-analysis that were carried out properly. The measure for screening is in accordance with recommendations in the practice guidelines with a B level of evidence according to the American Diabetes Association (2021). Providers who do not report screening may not be in the role where they would perform this function. Screening is recommended for all people at age 45 years but should be considered for people of younger ages in asymptomatic adults who are overweight or obese and who have one or more risk factors

as listed in the American Diabetes Association Standards of Care (2021). There are other recommendations that relate to screening children and adolescents based on other risk factors such as maternal or family history, race/ethnicity, signs of or conditions associated with insulin resistance. Diabetes statistics from the CDC as in the diabetic statistics report reveal that 88 million people in the United States were estimated to have prediabetes in 2018. There was not an increased prevalence from 2005-2008 compared to 2013-2016, however awareness doubled from 6.5% to 13.3% (CDC, 2020).

Improvements have occurred, however, based on data from the sample in Florida in this study there needs to be continued improvement to ensure people are both screened for prediabetes and are aware of what they need to do to reduce or to delay the risk of developing type 2 diabetes mellitus. It is important to consider what is important to health care professionals when designing future interventions for providers that relate to prediabetes, an example from this study might be examining and providing information on actual risk of hypoglycemia in patients that are prescribed medication for prediabetes. The data collected in this study sample of providers in Florida fills a gap in the literature by providing self-reported data that relate to adherence to the American Diabetes Association standards of care specific to prediabetes, for example, screening, and some factors that may need to be further explored with respect to prediabetes, for example, perceived versus actual risk of hypoglycemia when providing treatment intervention for people with prediabetes.

One previous study discussed characteristics associated with having received a diagnosis of prediabetes and the surrounding experiences prior to development of type 2 Diabetes Mellitus (Sommerville et al., 2020). In one other study it was noted that few

primary care providers (6%) were able to identify risk factors associated with screening for prediabetes (Tseng et al., 2017). Considering these prior studies, it would appear the health referral to expert or to Diabetes Prevention Program (DPP) was not frequently mentioned but also may not have been as readily available or able to be accessed as easily throughout the COVID-19 pandemic. Patient experience may be a different aspect to consider. In general conversation a provider discussed that the DPP program near them had closed and the nearest place to refer a patient to receive care was a city nearly an hour away, it was unclear whether the closure was temporary related to the COVID-19 pandemic. It was difficult to assess how many providers use the American Diabetes Association Standards of Care or other guidelines that are similar or based on these standards. An inquiry was completed to determine if there were any statistics to help estimate or to quantify usage of standards specifically for prediabetes. however, a response has not yet been received. Adherence to the Standards of Care as related to diabetes versus prediabetes has been discussed in the literature with statistics varying by adherence to a particular guideline or quality measure with ranges for adherence for measures such as HbA1c 58% and for lipids 57% (Dai et al., 2018). In another study referencing prediabetes it was reported 63% of providers reported using the ADA and 20% of providers did not favor and specific guideline for prediabetes screening (Tseng et al., 2017). Another study examining CEHC patients and comparative studies discussed that at least 50% of the CEHC patients met or exceeded goals in at least half of the biomarker categories with one other study that has similar results and most of the rest of the studies 50% compliance in 1-2 categories (Eldakroury et al., 2013). A study referencing lifestyle counseling for those with mild obesity discussed that 40% were not

counseled on caloric restriction and increasing physical activity and that 28% of people with BMI > 35 with diabetes were not counseled (Aneni et al., 2019). Statistics from the CDC Diabetes 2019 Report Card for preventive care practices for 2016 ranges from 55.3-69.7 percent based on the specific practice standard being assessed (CDC, 2020). There was not a statistically significant higher rate of compliance with the ADA practice guidelines in this sample of health care professionals in Florida compared to the national average, based on available data, however, the standards are for both diabetes and for prediabetes. Prediabetes awareness nationally is estimated to be 13.3% according to the National Diabetes Statistics Report (CDC, 2020). For this sample of providers based on self-reported behaviors prediabetes awareness for this sample would be expected to be higher based on screening rates, treatments provided, and advice provided by self-report, even though there did not appear to be a higher rate of adherence. It would be of interest to determine if a "report card" for prediabetes could be developed similarly to the diabetes report card.

Attitudes and barriers providers encounter when using or not using the standards of care are as described in the results section. Of the providers (n=5) who chose to participate in the interview portion of the study, some differences in attitudes and barriers were different, and some were similar between providers who had more favorable use of standards (n=3) compared to those who had less favorable use of standards (n=2). One difference was attitude toward the use of the standards for providers who reported usage of the standards had positive views and appeared to be more confident in the use of the standards, attitudes for providers not reporting use of standards included lack of familiarity less confidence in compared to expected work-related

standards. Time was a potential barrier expressed for both providers who report using and for providers who do not report using standards, educational needs with respect to use of guidelines was expressed by those reporting not using guidelines. Providers who reported usage of guidelines referenced time but with respect to length of standards and differences between standards. Providers who reported usage of the standards had positive attitudes toward quality measures and providers who did not report usage of standards were unsure about standards as relate to quality and may be perceived as a barrier. A specific barrier referenced by providers who use the guidelines was the time that is takes to read through the guidelines.

Providers who reported usage of standards and who did not report use of the standards were concerned about individual health history of patients as well as unique needs such as social needs that may be more patient versus population specific. Providers who reported usage of the standards appeared to have a patient centered attitude toward helping their patients understand what they needed to do to manage risk of disease and to reduce risk of disease. Providers who report not using the standards did not appear to have as much of a patient centered attitude with respect to screening and teaching but did discuss that they may refer them to others for this aspect of care. A barrier toward use of care described by providers was lack of human resources, with respect to providers using the standards they felt they needed more team members to help with follow-up; providers reporting not using the standards discussed the need for people to screen and to teach versus follow-up of patients. Providers who did report using the ADA standards of care also had an attitude of expectation to use, providers who reported not using the guidelines felt that they were expected to use guidelines at work versus other standards of care.

Self-reported attitudes were more favorable than not favorable regarding the preventative treatment of patients with prediabetes Attitudes and barriers centered around themes to include trust or belief, individuality or uniqueness with respect to patients and providers, usage and ease of usage as a barrier, education and skills both as a potential barrier or facilitator. Attitude toward work environment and expectations were important and time to include work related resources was a potential barrier. It should be noted that even though some providers did not use the American Diabetes Association standards of Care they may have been using other guidelines related to the work setting. Less than optimal intake of clinical practice guidelines was discussed in the context of clinical inertia in the literature (Lavoie, 2017). Skills and education as a theme could possibly relate to part of this, time was another term that was recurrent in the interview process and discussed in the literature (Lavoie, 2017).

Intentions, attitudes, barriers and norms may also relate to provider practice in the context of the TPB. It is possible some providers with less favorable views of the guidelines would benefit from additional education on the evidence base behind the American Diabetes Association Standards of Care or the recommendations; it is also possible that ways to make an easier pathway for providers to keep up with guidelines as they change or to have shortened versions or built-in reminders if using an electronic health record may help further increase screening and awareness. It may be beneficial to incorporate or educate within the work setting as related to using the standards of care as that appeared to be important based on the interview data.

Differences in attitude and barriers did exist for providers that report using the clinical practice guidelines for prediabetes compared to those who did not report using the

guidelines for prediabetes with key differences as related to the theory of planned behavior concerning themes related to standards and clinical guidelines with attitudes of trust being more prevalent for providers who report using guidelines and a potential barrier being time, ease of usage for providers reporting using the guidelines. Differences also centered around the theme of patient quality or uniqueness with providers who use the guidelines considering accuracy, specific population and individual health history and a potential barrier for those that report usage of guidelines referencing changes in guidelines, updates and ease of usage. Differences also centered around the theme of screening with providers who screen having more favorable attitudes concerning self-management and individual patient education and potential barriers for those providers who report following the guidelines referencing human resources to include teamwork and time as potential barriers.

**Limitations**

Limitations to the study include convenience sample of participants who had access to electronic device such as a phone or computer to access the survey link. It is expected that the people who chose to complete the questionnaire had interest in the topic so there could be bias. The small number of participants choosing to complete the interview portion (n=5) so results would apply to this sample rather than the population. Another limitation is the time between the planned study and actual completion.

**Strengths**

Strengths of the study include people who participated had an interest in the topic and were willing to participate and contribute their preferences in providing care for people with prediabetes. Quantitative and qualitative data used together may help to

further understand preferences for treatment and usage of standards of care as well as potential barriers from the health care professional view toward using the standards of care.

**Recommendations**

Additional data would be ideal to further assess my first research question, for example actual medical record data or statistics specific to prediabetes, however, as discussed even though the evidence available did not appear to support a statistically significant difference in guideline adherence increased awareness of diagnosis would likely be supported with self-reported data from this sample. More than one half (55%)of health professionals reported screening and provided advice concerning exercise and dietary advice that would likely lead to weight loss and (3/5) or 60% of providers reported following the American Diabetes Association Standards in the interview portion of the study. Some statistically significant associations based on the questionnaire responses were previously described and may need to be further explored in the context of providers who screen patients for prediabetes compared to those who do not screen patients for prediabetes. Trust in the guidelines is a theme that potentially could be both part of attitude and intention for screening with a lack of trust being a barrier for a provider not using the guidelines.

Patient individuality and individual provider preference related to both attitude and to barrier in guideline usage. Skills and education both for patients and for providers and time and adequate resources, summary tools, and impact on patient outcome may require additional follow-up with respect to the usage of the guidelines or standards of care. The medical record if electronic could serve to trigger reminders for aspects of the guidelines

and for helping to monitor patient outcomes. One study protocol discussed a user-centered approach to a behavioral economic electronic clinical support module (Chokshi et al., 2019). Prediabetes awareness should continue to be targeted to help prevent progression to type 2 Diabetes Mellitus, when possible, increase in awareness has improved from when this study was originally started, however, to just 13.3% (CDC, 2020).

**Implications for Social Change and Dissemination**

Education and awareness for those people with prediabetes in the context of preventing progression to type 2 Diabetes Mellitus, when possible is important for all people not only to reduce costs associated with disease progression and complications but also to improve quality of life, for example, prevention of amputations or kidney failure that are potential complications for those people with type 2 Diabetes Mellitus. One implication for social change is health care providers may need additional education, tools, or resources to adequately provide care and to be able to educate or to refer to a diabetes prevention program, especially during a pandemic which may be a unique aspect to consider and be a specific barrier for preventative care and or follow-up group care in the context of COVID-19. Group visits are discussed in the literature as one way to possibly enhance guideline adherence (Clancy et al., 2007). Group programs or services in a pandemic timeframe may or may not be feasible and would need to consider risk versus benefit and whether patients would be willing to participate if facilities were available and guidelines such as social distancing and mask guidelines able to be followed. While virtual care may be possible for some, it may not be possible for others who do not have or are not able to use virtual technology. This aspect of social change

with respect to both this study and to health care for other programs and services would likely need to be addressed on many levels. Some organizations were able to adapt to virtual care quickly during the pandemic timeframe others were unable to adapt as quickly and even for those that did patients did not necessarily have the equipment and skills needed for virtual visits.

Other literature suggests diabetes flow sheet as being associated with guideline adherence (Hahn et al., 2008). One important consideration is that resources available to providers may vary by geographical area and in some rural areas or other locations there may be less access to programs such as the DPP due to the changing nature of healthcare, to include more virtual offerings and less in person time during the COVID-19 pandemic, other forms of programs both for awareness and for education after a person becomes aware of prediabetes need consideration. The fact that COVID-19 became a devastating pandemic is a reminder that in the pandemic preventive care should not be ignored and in fact those with other conditions such as type 2 diabetes may be more at risk of disease and complications associated with the same. Addressing prediabetes in the context of preventive care and for social change aspects of care is an important consideration. Ideally all people with prediabetes would be aware that they have it and have the knowledge and education to know what they need to know to reduce risk of developing or delaying the progression to type 2 diabetes mellitus, should they choose to do so. Individualization for both patients and for provider preferences is vital. Prior to an educational intervention for a patient or for a provider, their individual views and goals should be reviewed. Talking about or discussing both prediabetes and standards of care as a ‘lunch and learn’ is one form of dissemination. If even one person became more aware

of prediabetes or one person with prediabetes is able to take appropriate measures to prevent progression to type 2 Diabetes Mellitus then likely one more would also and the rates of awareness would be more likely to increase, when people see improvements in their health or the health of others they will likely tell others and the rates of prediabetes awareness will hopefully continue to increase which may help to decrease or delay progression to type 2 Diabetes Mellitus and the devastating complications that may be associated with the disease.

## Summary

Adherence to guidelines is one aspect of care to consider for providers with patients that have prediabetes, however, it is not the only aspect of care to consider. For example, if all providers screened and provided care or referral services to their patients with prediabetes, some patients may not choose to follow through on recommendations or may not have the resources to follow through on recommendations. One important topic that came up during this study was individualization. Individualization relates to both interventions provided to providers and to patients. An example from this study might be if you were designing an intervention for a provider who was not using a medication that might be recommended based on the patient's specific disease risk, hypoglycemic concern of provider would need to be considered in the educational intervention. An example from the patient aspect might be a provider screened a patient and diagnosed them with prediabetes and decided to refer the patient to a diabetes prevention program; when the patient followed through and called the facility referred to, it was ninety minutes away and they were unable to drive to the program for the classes. The focus of this study was on providers as relate to patient care reported as provided,

preferences for care as well as attitudes and barriers to providing care according to recommended standards for people with prediabetes. It might be interesting to examine information from the patient aspect as well. The health care professionals in this sample discussed individual or unique aspects of patients to include their medical history and their social situation. Similarly, to providers attitudes and barriers toward providing care and using standards, patients would likely have attitudes toward care provided and recommendations for care as well as barriers to following up on recommended care or understanding how certain aspects of what they choose to do or not to do might relate to their health in the context of this study, considering following prediabetes treatment recommendations to prevent or to delay the development of type 2 diabetes mellitus. Education and awareness of prediabetes is important from both the provider aspect and from the patient aspect. Awareness has increased from the start of this project, however, there is still a long way to go not only to increase awareness, but for those who are diagnosed with prediabetes to have access to diabetes prevention programs or other similar programs and to make sure they have the resources needed to follow through on recommended care if they choose to do so.

## References

Abdul-Ghani, M., DeFronzo, R. A., & Jayyousi, A. (2016). Prediabetes and risk of diabetes and associated complications: impaired fasting glucose versus impaired glucose tolerance: Does it matter? *Clinical Nutrition and Metabolic Care, 19*(5), 394-399. doi:10.1097/MCO.0000000000000307

Adams, A., Realpe, A. Vail, L., Buckingham, C. D., Erby ,L. H., & Roter, D. (2015). How doctors' communication style and race concordance influence African–Caribbean patients when disclosing depression. *Patient Education and Counseling*, 98, 1266-1273. doi:10.1016/j.pec.2015.08.019

Ajzen, I. (1991). The theory of planned behavior. Organizational behavior and human decision processes 50, 179-211. Academic Press, Inc.

Ajzen, I. (2006). Constructing a theory of planned behavior questionnaire. https://people.umass.edu

Alan, G. (2015). Anti-obesity pharmacotherapy and the potential for preventing progression from prediabetes to type 2 diabetes. *Endocrine Practice*, *21*(6), 634-644.

Albright, A. L. & Gregg, E. W. (2013). Preventing type 2 diabetes in communities across the US: The national diabetes prevention program. *American Journal of Preventive Medicine, 44*, S346-S351.

Alva, M.L., Gray, A., Mihaylova, B., Leal, J., & Holman, R.R. (2014). Research: Health economics the impact of diabetes-related complications on healthcare costs: New

results from the UKPDS (UKPDS 84). *Diabetic Medicine.* doi:10.1111/dme.12647

American Diabetes Association (2004). Diagnosis and classification of diabetes mellitus. *Diabetes Care*, Supplement 1, s5-s10. doi:10.2337/diacare.27.2007.s5

American Diabetes Association (2010). Standards of medical care in diabetes – 2010. *Diabetes Care*, *33*, Supplement 1, S11-S61.doi:10.2337/dc10-S011

American Diabetes Association (2013). Economic costs of diabetes in U.S. in 2012. *Diabetes Care*, *36*, 1033-1046. doi: 10.2337/dc12-2625

American Diabetes Association (2014). Summary of revisions to the 2014 clinical practice recommendations. *Diabetes Care*, *37*, Supplement 1. doi: 10.2337/dc14-S004

American Diabetes Association (2014). Economic burden of prediabetes up 74 percent over five years. http://www.diabetes,org/newsroom/press-releases/2014/economic-burden-of-prediabetes-up-74-perceent-over-five-years.html

American Diabetes Association (2015). Fast facts data and statistics about diabetes. https://professional.diabetes.org

American Diabetes Association (2015). Standards of medical care in diabetes-2015 abridges for primary care providers. *Clinical Diabetes Journals*, *33* (7), 97-113.doi:10.2337/diaclin.33.2.97

American Diabetes Association (2016). Standards of medical care in diabetes-2016 Abridged for primary care providers. *Clinical diabetes: a publication of the American Diabetes Association*, *34*(1), 3–21. doi.10.2337/diaclin.34.1.3

American Diabetes Association (2021). Prevention or delay of type 2 diabetes: Standards of medical care in diabetes-2021. *Diabetes Care,* (Suppl. 1) S34-S39

Anderson, Z. L., Scopelliti, E. M., Trompeter, J. M., & Havrda, D. E. (2015). Management of prediabetes: A comparison of the treatment approaches utilized by a family practice clinic and an internal medicine/endocrinology practice. *Journal of Pharmacy Practice*. doi: 10.10.1177/0897190013514089.

Aneni, E., Valero-Elizondo, J., Osondu, C. U., Brandt, E. J., & Nasir, K. (2019) Abstract MP30: Gaps in provider lifestyle counseling among obese adults with diabetes in the United States. *American Heart Association*, *139*, supplement 1. https://doi.org/10.1161

Aroda, V. R., & Ratner, R. (2008). Approach to the patient with prediabetes. *Journal of Clinical Endocrinology and Metabolism*, *93*(9), 3259-3265. doi: 10.1210/jc2008-1091

Bansal, N. (2015) Prediabetes diagnosis and treatment: A review. *World Journal of Diabetes*, *6*(2), 296-303. doi:10.4239/wjd.v6.i2.296

Barnes, E. R., Theeke, L. A., & Mallow, J. (2015). Impact of the provider and healthcare adherence to treatment guidelines (PHAT-G) intervention on adherence to national obesity clinical practice guidelines in a primary care center. *Journal of Evaluation in Clinical Practice*, *21*, 300-306.

Bassand, J. P., Hamm, C. W., Ardissino, D., Boersma, E., Budaj, A., Fernandez-Aviles, F., & …Wijns, W. (2007). Guidelines for the diagnosis and treatment of no-st-segment elevation acute coronary syndromes of the European society of

cardiology. *European Heart Journal*, *28*, 1598-1660. doi: 10.1093/eurheartj/ehm161

Basavareddy, A., Dass, A. S., & Naravana, S. (2015). Prediabetes awareness and practice among Indian doctors-a cross-sectional study. *Journal of Clinical and Diagnostic Research*, *8.* doi:10.7860/JCDR/2015/13391.6290

Behrens, T.K., & Harbour, V.J. (2014). Physician intention to counsel on physical activity: Results from a pilot theory of planned behavior questionnaire. *Journal of Public Health Aspects*, 1:2. doi: 10.7243/2055-7205-1-2

Bergman, M. (2013). Pathophysiology of prediabetes and treatment implications for the prevention of type 2 diabetes mellitus. *Endocrine*, *43*, 504-513. doi:10.1007/s12020-01209830-9

Best, A., Berland, A., Herbert, C., Bitz, J., van Dijk, M. W., Krause, C., Cochrane, D., & … Millar, J. (2016). Using systems thinking to support clinical system transformation. *Journal of Health Organization and Management*. *30*(3) 302-323. doi:10.1108/JHOM.12-2014-0206

Bodenheimer, T. (2003). Interventions to improve chronic illness care: Evaluating their effectiveness. *Disease Management*, *6*(3), 63-71.

Boyle, J. P., Thompson, T. J., Gregg, E. W., Baker, L. E., & Williamson, D. F. (2010). Projection of the year 2050 burden of diabetes in the us adult population: Dynamic modeling of incidence, mortality, and prediabetes prevalence, *8*(29). *Population Health Metrics.* doi:10.1186/1478-7954-8-29

Bridges, D. R., Davidson, R. A., Odegard, P. S., Maki, I. V., & Tomkowiak, J. (2011). Interprofessional collaboration: Three best practice models of interprofessional education. *Medical Education Online*, *16*, 1-10. doi:10.3402/meo. v1610.6035

Brunisholz, K. D., Joy, E. A., Hashibe, M., Gren, L. H. Savitz, L.A., Hamilton, S., Cannon, W. & Kim, J. (2016). Incidental risk of type 2 diabetes mellitus among patients with confirmed and unconfirmed prediabetes. *Plos One*, 1-9. doi: 10.1371/journal.pone.0157729

Burgess, A. M., Chang, J., Nakamura, B. J., Izmirian, S., & Okamura, K. H. (2016). Evidence-based practice implementation within a theory of planned behavior framework. *Journal of Behavioral Health Services & Research*, 1-18. doi:10.1007/s11414-016-9523-x

Cabana, M., Slish, K. K., Nan, B., Leo, H., Bratton, S.L., & Dombkowski, K. J. (2006). Outcomes associated with spirometry for pediatric asthma in a managed care organization. *Pediatrics*, *118*(1), e151-e156. doi:10.1542/peds2005-2352

Canada, R.E., DiRocco, D., & Day, S. (2014). A better approach to opioid prescribing in primary care. *Journal of Family Practice*, *63*(6), E1-E8.

Carlsen, B., & Norheim, O.F. (2008) "What lies beneath it all" – an interview study of GPs' attitudes to the use of guidelines. *BMH Health Sciences Research*, 8, 218. doi: 10.1186/1472-6963-8-218

Caruso, L.B., Clough-Gorr, K.M., & Silliman, R.(2007). Improving quality of care for urban older people with diabetes mellitus and cardiovascular disease. *Journal of the American Geriatric Society, 55*(10), 1656-1662. doi:10.1111/j.1532-5415.2007.01320.x

Centers for Disease Control and Prevention (2011). *National diabetes fact sheet: National estimates and general information on diabetes and prediabetes in the United States*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention. *National diabetes statistics report*. (2020). Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services

Centers for Disease Control and Prevention (2014). *National diabetes statistics report: Estimates of diabetes and its burden in the United States*. Atlanta, GA: U.S. Department of Health and Human Services.

Centers for Disease Control and Prevention (2016). *Defining adult overweight and obesity*. https://www.cdc.gov/obesity/adult/defining.html

Centers for Disease Control and Prevention. (2017). *Diabetes fact sheets, at a glance 2016, diabetes working to reverse the US epidemic*. www.cdc.gov/diabetes/library/fact sheets.html

Centers for Disease Control and Prevention. (2019). *Diabetes report card* 2019. Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services. Centers for Disease Control and Prevention (2020). *National diabetes statistics report 2020 estimates of diabetes and its burden in the United States*. Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services.

Centers for Medicare and Medicaid Services. (2017). *Electronic health record (EHR) incentive programs*. https://www.cms.gov/Regulations-and-

Guidance/Legislation/EHRIncentivePrograms/index.html?redirect=/EHRIncentivePrograms/

Chaudoir, S. R., Dugan, A. G., & Barr, C. H. (2013). Measuring factors affecting implementation of health innovations: A systematic review of structural, organizational, provider, patient, and innovation level measures. *Implementation Science*, *8*(22).

Chilton, R., Wyatt, J., Nadish, S., Oliveros, R., & Lujan, M. (2011). Cardiovascular comorbidities of type 2 diabetes mellitus: Defining the potential of glucagonlike peptide–1-based therapies. *American Journal of Medicine*, *124*, S35-S53. doi:1.1016/j.amjmed.2010.11.004

Chimeddamba, O., Peters, A., Ayton, D., Tumenjargal, E., Sodov, S., & Joyce, C. (2015). Implementation of clinical guidelines on diabetes and hypertension in urban Mongolia: A qualitative study of primary care providers' perspectives and experiences. *Implementation Science*, *10*(112). doi: 10.1186/s13012-015-0307-0

Chokshi, S. K., Belli, H. M., Troxel, A. B., Blecker, S., Blaum, C., Testa, P., & Mann, D. (2019). Pilot and feasibility studies study protocol. Designing for implementation: User-centered development and pilot testing of a behavioral economic-inspired electronic health record clinical decision support module. *BMC*. https://doi.org/10.1186/s40814-019-0403-z

Chrimes, D., Kitos, N. R., Kushniruk, A., & Mann, D. M. (2014). Usability testing of avoiding diabetes thru action plan targeting (ADAPT) decision support for integrating care-based counseling of pre-diabetes in an electronic health record. *International Journal of Medical Informatics*, *83*, 636-647.

Chu, T., & Chen, Y. (2015). With good we become good: Understanding e-learning adoption by theory of planned behavior and group influences. *Computers & Education*, *92-93*, 37-52. https://dx.doi.org/10.1016/j.compedu.2015.09.013

Clancy, D. E., Huang, P., Okonofua, E., Yeager, D., & Magruder, K. M. (2007). Group visits: Promoting adherence to diabetes guidelines. *JGIM*, *22*, 620-624. doi:10.1007/s11606-007-0150-3

Cloney, T. A., Galer-Unti, R. A., & Barkley, W. M. (2011). Provider practices in prediabetes intervention and diabetes prevention: Application of evidence-based research in the medical office setting. *Journal of Primary Care & Community health*. doi:10.1177/2150131911401625

Creswell, J. W. (2009). The selection of a research design. In *Research design qualitative, quantitative and mixed method approaches* (pp.3-21). Sage Publications, Inc.

Creswell, J. W. (2009). Qualitative procedures. In *Research design qualitative, quantitative and mixed method approaches* (pp.173-202). Sage Publications, Inc.

Creswell, J. W. (2009). Mixed methods procedures. In *Research design qualitative, quantitative and mixed method approaches* (pp.203-225). Sage Publications, Inc.

Curran, V. R., Hollett, A., Allen, M., Steeves, J., & Dunbar, P. (2008). *Canadian Journal of Diabetes*, *32*(4), 273-280.

Dacey, M., Arnstein, F., Kennedy, M. A., Wolfe, J., & Phillips, E. M. (2013). The impact of lifestyle medicine continuing education on provider knowledge, attitudes, and counseling behaviors. *Medical Teacher*, *35*(5), e1149-56.doi:10.3109/0142159X.2012.733459

Dai, M., Peabody, M. R., Peterson, L. E., & Mainous III, A. G. (2018). Adherence to clinical guidelines for monitoring diabetes in primary care settings. *Family Medicine and Community Health, 6*(4) 161-167. doi:10.15212/FMCH.2018.0121

Dall, T. M., Venkat Narayan, K. M., Gillespie, K. B., Gallo, P. D., Blanchard, T. D., Solcan, M. &…Quick, W. W. (2014). Detecting type 2 diabetes among asymptomatic adults in the United States modeling American diabetes association versus US preventive services task force screening guidelines. *Population Health Metrics*, *12*(12). doi: 10.1186/1478-7954-12-12

Dall, T. M., Yang, W., Halder, P., Pang, B., Massoudi, M., Wintfeld, N., Semilla, A. P., & … Hogan, P. F. (2014). The economic burden of elevated blood glucose levels in 2012: Diagnosed and undiagnosed diabetes, gestational diabetes mellitus, and prediabetes. *Diabetes Care*, *37*(12), 3172-3179. doi:10.2337/dc14-1036

DeFronzo, R. A., & Abdul-Ghani, M. (2011). Assessment and treatment of cardiovascular risk in prediabetes: Impaired glucose tolerance and impaired fasting glucose. *The American Journal of Cardiology*, *108*(3S). doi:10.1016/j.amjcard.2011.03.013

DeMik, D. E., Vander Weg, M. W., Lundt, E. S., Coffey, C. S., Ardey, G., & Carter, B. L. (2013). Using theory to predict implementation of a physician-pharmacist collaborative intervention within a practice-based research network. *Research in Social and Administrative Pharmacy*, *9*, 719-730. https://doi.org/10.1016/j.sapharm.2013.01.003

De Quevedo, I. G., Siminerio, L., L'Heveder, R., & Cenkat Narayan, K. M. (2012). Challenges in real-life translation research: early lessons from bridges projects.

*Diabetes Research and Clinical Practice*, *95*, 317-325. doi: 10.1016/j.diabres.2011.10.013

Dhippayom, T., Chaiyakunapruk, N., & Krass, I. (2014). How diabetes risk assessment tools are implemented in practice: A systematic review. *Diabetes Research and Clinical Practice*, *104*, 329-342. doi: 10.1016/j.diabetes.2014.01.008

Diabetes Prevention Program Research Group. (2009). 10-year follow-up of diabetes incidence, 1677-1686. doi:10.1016/S)1140-6736(09)61457-4.

Diabetes Prevention Program Research Group. (2015). Long-term effects of lifestyle intervention or metformin on diabetes development and microvascular complications: The DPP outcomes study. *Lancet Diabetes Endocrinology, 3*(11), 866-875. doi:10.1016/S2213-8587(15)00291-0

Diabetes Research Institute (n.d.) *The Islets of Langerhans.* https://www.diabetesresearch.org/islet-cells

Dodani, S., & Fields, J.Z. (2010). Implementation of the fit body and soul, a church-based life style program for diabetes prevention in high-risk African Americans. *The Diabetes Educator*, *36*(3), 465-472. doi: 10.1177/0145721710366756

Dorsey, R. & Songer, T. (2011). Lifestyle behaviors and physician advice for change among overweight and obese adults with prediabetes and diabetes in the United States, 2006. *Prev Chronic Dis*, 8(6), 132. http://www.cdc.gov/pcd/issues/2011/nov/10.0221.htm,

Dunkley, A. J., Bodicoat, D. H., Greaves, C. J., Russell, C., Yates, T., Davies, M. J., & Khunti. K. (2014). Diabetes prevention in the real world: Effectiveness of the pragmatic lifestyle interventions for the prevention of type 2 diabetes and of the

impact of adherence to guideline recommendations. *Diabetes Care*, *37*, 922-933. doi:10.2337/dc13-2195

Dyal, B., Whyte, M., Blankenship, S. M., & Ford, L. G. (2016). Outcomes of implementing an evidence□based hypertension clinical guideline in an academic nurse managed health center. *Worldviews on Evidence□Based Nursing*, *13*(1), 89-93.

Eikenberg, J. D., & Davy, B. M. (2013). Prediabetes: A prevalent and treatable, but often unrecognized, clinical condition. doi:10.1016/jand.2012.10.018

Eldakroury, A., Olivera, E. P., Bicki, A., Martin, R. F., & DE Groot, A.S. (2013). Adherence to American diabetes association guidelines in a volunteer-run free clinic for the uninsured: Better than standards achieved by clinics for insured patients, *Rhode Island Medical Journal,* 25-29.

Farias, M., Jenkins, K., Lock, J., Rathod, R., Newburger, J., Bates, D. W., Safran, D. G., Friedman, K., & Greenberg, J. (2013). Standardized clinical assessment and management plans (SCAMPS) provide a better alternative to clinical practice guidelines. *Health Affairs*, *32*(5), 911-920. doi:10.1377/hthaff.2012.0667

Ferrannini, E., Gastadelli, A., & Iozzo, P. (2011). Pathophysiology of prediabetes. *Med Clin N Am*, *95*, 327-339. doi:10.1016/j.mcna.2010.11.005

Fisher, W. A., Kohut, T., Salisbury, C. M. A., & Salvadori, M. (2013). Understanding human papillomavirus vaccination intentions: Comparative utility of the theory of reasoned action and the theory of planned behavior in vaccine target age women and men. *The Journal of Sexual Medicine*, *10*(10), 2455-2464. doi:10.1111/jsm.12211

Fleiszer, A. R., Semenic, S. E., Ritchie, J. A., Richer, M. C., & Denis, J. L. (2016). A unit-level perspective on the long-term sustainability of a nursing best practice guidelines program: An embedded multiple case study. *International Journal of Nursing Studies*, *53*, 204-218. doi:10.1016/inrstu.2015.09.004

Fowler, M. J. (2008). Microvascular and macrovascular complications of diabetes. *Clinical Diabetes*, *26*(2), 78-82. doi:10.2337/diaclin.26.2.77

France, L., Freitas, A., Thompson-Leduc, P., Bourdas, F., Francesca, L., Andree, B., Witteman, H. O., & Andre, J. (2015). The majority of accredited continuing professional development activities do not target clinical behavior change. *Academic Medicine*, *90*(2), 197-202. doi:10.1097/ACM.000000000000543

Francis, B. H., Song, X., Andrews, L. M., Purkayastha, D., Princic, N., Sedgley, R., & Rudolph, A. E. (2011). Progression to type 2 diabetes, healthcare utilization, and cost among pre-diabetes patients with or without comorbid hypertension. *Current Medical Research and Opinion*, *27*(4), 809-819. doi:10.1185/03007995.2011.554806

Franck, S. D., Stolberg, R. L., Bilich, L. A., & Payne, L. E. (2014). Point-of-care HbA1c screening predicts diabetic status of dental patients. *The Journal of Dental Hygiene*, *88*(1), 42-52.

Frels, R. K. & Onwuegbuzie, A. J. (2013). Administering quantitative instruments with qualitative Interviews: A mixed research approach. *Journal of Counseling & Development, 91*(2), 184-194. doi:10.1002/j.1556-6676.2013.00085.x

Frankfort-Nachmias, C., & Nachmias, D. (2008). Sampling and sampling design. In *Research methods in the social sciences* (pp. 161-185). Worth Publishers.

Gaede, P., Vedel, P., Larsen, N., Jensen, G. V. H., Parving, H., & Pederson, O. (2003). Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. *The New England Journal of Medicine, 348*(5), 383-393.

Garber, A. J. (2015). AACE/ACE Comprehensive diabetes management algorithm 2015. *Endocrine Practice, 21*(4), 438-447. doi:10.4158/EP15693.CS

Galloway, I. (2014). Using pay for success to increase investment in the nonmedical determinants of health. *Health Affairs*, *33*(11), 1897-1904. doi:10.1377/hlthaff.2014.0741

Gance-Cleveland, B. (2013). Motivational interviewing for adolescent obesity. *AJN The American Journal of Nursing*, *113*(1), 11.

Gance-Cleveland, B., Sidora-Arcoleo, K., Gottesman, M. M., & Brady, M. (2009). Changes in nurse practitioner's knowledge and behaviors following brief training on healthy eating and activity together (HEAT) guidelines. *Journal of Pediatric Healthcare*, *23*(4), 222-230. doi:10.1016/j.pedhc.2008.0.3.002

Garrison, L. P. (2016). Cost-effectiveness and clinical practice guidelines: Have we reached a tipping point? – an overview. *Value in Health, 19*, 512-515. doi: 10.1016/j.jval.2016.04.018

Geiss, L. S., James, C., Gregg. E. W., Albright, A., Williamson, D. F., & Cowie, C. C. (2010). *American Journal of Preventive Medicine*, *38*(4), 403-409. doi: 10.1016/j.ampre.2009.12.029

Gillespie, C. D. & Hurvitz, K. A. (2013). *Prevalence of hypertension and controlled hypertension, United States, 2007-2010*. Centers for Disease Control and

Prevention, Morbidity and Mortality Weekly Report (MMWR). https://www.cdc.gov/mmwr/preview/mmwrhtml/sub6203a24.htm

Giraldez, R. R., Clare, R., Lopes, R. D., Dalby, A. J., Prabhakaran, D., Brogan, G. X. Glugliano, R. P., & …Newby, L. K. (2013). Prevalence and clinical outcomes of undiagnosed diabetes mellitus and prediabetes among patients with high-risk non- ST-segment elevation acute coronary syndrome. *American Heart Journal*, *165*(6), 918-925. doi:10.1016/j.ahj.2013.01.005

Gopalan, A., Lorincz, I. S., Wirtalla, C., Marcus, S. C., & Long, J. A. (2015). Awareness of prediabetes and engagement in diabetes risk-reducing behavior. *American Journal of Preventative Medicine*, *49*(4), 512-519.

Hackman, C. L. & Knowlden, A. P. (2014). Theory of reasoned action and theory of planned behavior-based dietary interventions in adolescents and young adults: A systematic review. *Adolescent Health, Medicine and Therapeutics*, *5*, 101-114.

Hahn, K. A., Ferrante, J. M., Crosson, J. C., Hudson, S. V., & Crabtree, B. F. (2008). Diabetes flow sheet use associated with guideline adherence. *Annals of Family Medicine*, *6*, 235-238. doi:10.137/afm.812.

Harris, M. I., Klein, R., Welborn, T. A., & Knulman, M. W. (1992). Onset of NIDDM occurs at least 4-7 years before clinical diagnosis. *Diabetes Care*, *15*(7), 815-819.

Heikes, K. E., Eddy, D. M., Arondekar, B., & Schlessinger, L. (2008). Diabetes Risk Calculator: A simple tool for detecting undiagnosed diabetes and pre-diabetes. *Diabetes Care*, *31*(5), 1040-1045.

Heisey-Grove, Danehy, L. N., Consolazio, M., Lynch, K., & Mostashari, F. (2014). A national study of challenges to electronic health record adoption and meaningful use. *Medical Care*, *52*(2), 144-158.

Hersch, L., Salzman, B. & Snyderman, D. (2015). Health literacy in primary care practice. *American Family Physician*, *92*(2), 118-124.

Hooks-Anderson, D. R., Crannage, E. F., Salas, J., & Scherrer, J. F. (2015). Race and referral to diabetes education in primary care patients with prediabetes and diabetes. *The Diabetes Educator*, *41*(3), 281-289. doi:10.1177/0145721715574604

Huang, Y., Cai, X., Chen, P., Mai, W., Tang, H., Huang, Y., & Hu, Y. (2014). Associations of prediabetes with all-cause and cardiovascular mortality: A meta-analysis. *Annals of Medicine*, *46*, 684-692. doi:10.3109/07853890.2014.955051

Hung, D. Y., Leidig, R., & Shelley, D. R. (2014). What's in a setting? Influence of organizational culture on provider adherence to clinical guidelines for treating tobacco use. *Health Care Manage Review, 39*(2). doi:10.1097/HMR.Ob013e3182914d11

Jun, J., & Arendt, S. W. (2016). Understanding healthy eating behaviors at casual dining restaurants using the extended theory of planned behavior. *International Journal of Hospitality Management*, *53*, 106-115. https://dx.doi.org/10.1016/j.ijhm.2015.12.002

Jun, J., Kovner, C. T., & Stimpel, A. W. (2016). Barriers and facilitators of nurses use of clinical practice guidelines: An integrative review. *International Journal of Nursing Studies*, *60*, 54-68. doi:10. 1016.jnurstu.2016.03.006

Keane, K., & Newsholme, P. (2014). Metabolic regulation of insulin secretion. In G. Litwick (Ed.), *The pancreatic beta cell* (pp. 1-26). Academic Press.

Kim, H., Tracy, E. M., Biegel, D. E., Min, M. O., & Munson, M. R. (2015). The effects of organizational culture on mental health service engagement of transition age youth. *The Journal of Behavioral Health Services & Research, 42*(4), 466-485.

Khaodhiar, L., Cummings, S. & Apovian, C. M. (2009). Treating diabetes and prediabetes by focusing on obesity management. *Curr Diab Rep, 9,* 348–354. doi:10.1007/s11892-009-0055-0

Kirkman, M. S., Williams, S. R., Caffrey, H. H., & Marrrero, D. G. (2002). Impact of a program to improve adherence to diabetes guidelines by primary care physicians. *Diabetes Care*, *25*(11), 1946-1951.

Ko, M., Murphy, J., & Bindman, A. B. Integrating health care for the most vulnerable: Bridging the differences in organizational cultures between us hospitals and community health centers. *American Journal of Public Health*, *105*(55). doi: 10.2015/AJPG.2015.302931

Korner, M., Wirtz, M. A., Bengel, J., & Goritz, A. S. (2015). Relationship of organizational culture, teamwork and job satisfaction in interprofessional teams. *BMC Health Services Research*, *14*, 243. doi:10.1186/s12913-015-0888-y

Kortteisto, T., Kaila, M., Komulainen, J., Mantyranta, T., & Rissanen, P. (2010). Healthcare professionals' intentions to use clinical guidelines: A survey using the theory of planned behavior. *Implementation Science*, *5*(51). doi:10.1186/1748-5908-5-51

Kuntz, S., Johnson, E.L., Blehm, J., & Hosford, C. C. (2012). Use of A1C for screening and diagnosis of type 2 diabetes in three rural health care systems. *Clinical Diabetes*, *30*(2), 61-66.

Kupersmith, J., Francis, J., Kerr, E., Krein, S., Pogach, L., Kolodner, R. M., & Perlin, J. B. (2007). Advancing evidence-based care for diabetes: lessons from the veteran's health administration. *Health Affairs, 26*(2), w 156-w168. doi: 10.1377/hlthaff.26.2w156

Laiteerapong, N. (2016). JAMA clinical guidelines synopsis, screening for prediabetes and type 2 diabetes mellitus. *JAMA*, *315*(7), 697-698.

Lavoie, K. L., Rash, J. A., Campbell, T. S. (2017). Changing provider behavior in the context of chronic disease management: Focus on clinical inertia. *The Annual Review of Pharmacology and Toxicology*, *67*, 263-283. doi:10.1146/annurev-pharmtox-010716-104952

Lauritzen, T., Borch-Johnsen, K., & Sandboek (2006). Is prevention of type 2 diabetes feasible and efficient in primary care? A systematic PubMed review. *Primary Care Diabetes*, *1*, 5-11. doi: 10.1016/j.pcd.2006.11.001

Lefebvre, C. R., Doner, L., Johnston, C., Loughrey, K., Balch, G. I., Sutton, S. M. (1995). Use of database marketing and consumer-based health communication in message design: an example from the office of cancer communication "5 a day for better health" program. In E. Maibach, & R.L. Parrott (Eds.), *Designing health messages: Approaches from health communication theory and public health practice* (pp. 217-246). Sage Publications, Inc.

Legal Information Institute (n.d.) *U.S. code, 38 U.S. code 101-definitions.* https://www.law.cornell.edu.uscode/text/38/101#

Li, R., Bilik, D., Brown, M. B., Zhang, P., Ettner, S., Ackermann, R. T., Crosson, J. C., & Herman, W. H. (2013). Medical costs associated with type 2 diabetes complications and comorbidities. *The American Journal of Managed Care*, *19* (5). 421-430.

Liaw, S. T., Taggart, J., Yu, H., de Lusignan, S., Kuziemsky, C., & Hayden, A. (2014). Integrating electronic health record information to support integrated care: Practical application of ontologies to improve the accuracy of diabetes disease registers. *Journal of Biomedical Informatics*, *52*, 364-372. doi: 10.1016/j.jbi.2014.07.016

Long, A., & Dogogo-Jack, S. (2011). Comorbidities of diabetes and hypertension: Mechanisms and approach to target organ protection. *The Journal of Clinical Hypertension*, *13*(4), 244-251. doi:10.1111/j.1751-7176.2011. 00434.x

Ma, J., Yank, V., Xiao, L., Lavori, P. W., Wilson, S. R., Rosas, L. G., & Stafford, R. S. (2013). Translating the diabetes prevention program lifestyle intervention for weight loss in primary care. *JAMA Internal Medicine*, *173*(2), 113-121. doi: 10.1001/2013.jamainternmed.987

Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A comparison of the theory of planned behavior and the theory of reasoned action. *Personality and Social Psychology Bulletin*, *18*(1), 3-9.

Manca, D. P., Campbell-Scherer, D., Aubrey-Bassler, K., Kandola, K., Aguilar, C., Baxter, J., Meaney, C., Salvalaggio, G., Carroll, J.C., Faria, V., Nykiforuk, C.,

Grunfeld, and the original BETTER Trial Investigators and Clinical Working Group. (2015). *Implementation Science*, *10*(107). doi:10.1186/s13012-015-0299-9

Magnan, E. M., Gittelson, R., Bartels, C. M., Johnson, H.M., Pandhi, N., Jacobs, E. A., & Smith, M. A. (2015). Establishing chronic condition concordance and discordance with diabetes: A delphi study. *BMC Family Practice*, *16*(42). doi:10.1186/s12875-015-0253-6

Maindal, H. T., Bonde, A., & Aagaard-Hansen, J. (2014). Action research led to a feasible lifestyle intervention in general practice for people with prediabetes. *Primary Care Diabetes*, *8*, 23-29. https://dx.doi.org/10.1016/j.pcd.2013.11.007

Martin, C., Daly, A., McWhorter, L. S., Shwide-Slavin, C., & Kushion, W. (2005). The scope of practice, standards of practice, and standards of professional performance for diabetes educators. *The Diabetes Educator*, 31 (4), 487-512. https://doi.org/10.1177/0145721705279719

Maxson, E., Jain, S., Kendall, M., Mostashari, F., & Blumenthal, D. (2010). The regional extension center program: helping physicians meaningfully use health information technology. *Annals of Internal Medicine*, *153*(10), 666-670. doi:10.7326/0003-4819-153-10-201011160-00011

Medical Dictionary. (2103). *Outcome assessment.* https://www.medicaldictionary.com

Mellbin, L. G., Anselmino, M., & Ryden, L. (2010). Diabetes, prediabetes, and cardiovascular risk, *17* (Suppl 1). doi: 10.1097/01/hjr.0000368192.24732.2f

Merriam-Webster. (n.d.) Hemoglobin a1c. https://www.merriam-webster.com/medical

McMaughan, D. K., Huber, J.C., Forjuoh, S. N., Vuong, A. M., Helduser, J., Ory, M. G., & Bolin, J. N. (2016). Physician recommendation of diabetes clinical protocols. *Hospital Topics*, *94*(1), 15-21. doi:10.1080/00185868.2016.1142313

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science*, *10*(53) .doi:10.1186/s13012-015-0242-0

O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for reporting qualitative research: A synthesis of recommendations. *Academic Medicine*, *89*(9), 1245-1251. doi:10.1097/ACM.0000000000000388

O'Cathain, A., Murphy, E., & Nicholl, J. (2010). Three techniques for integrating data in mixed method studies. BMJ, 341: c4587

Oglesby, A. K., Secnik, K., Barron, J., Al-Zakwan, I., & Lage, M. J. (2006). The association between diabetes related medical costs and glycemic control: A retrospective analysis. *Cost Effective Resource Allocation, 4*(1).

Okelo, S. O., Butz, A. M., Sharma, R., Diette, G. B., Pitts, S. L., King, T. M., Linn, S. T., Reuben, M., Chellandurai, Y., & Robinson, K. A. (2013). Interventions to modify healthcare provider adherence to asthma guidelines: A systematic review. *Pediatrics*, *132*(3), 517-534. doi:10.1542/peds.2013-0779

Osburn, C. Y., Kozak, C., & Wagner, J. (2010). Theory in practice: Helping providers address depression in diabetes care. *Journal of Continuing Education in the Health Professions*, *30*(3), 172-179. doi:10.1002/chp.20078

Patton, M. Q. (2002). Strategic themes in qualitative inquiry. In *Qualitative research & evaluation methods* (pp. 37-73). Sage Publications, Inc.

Patton, M. Q. (2002). Variety in qualitative inquiry. In *Qualitative research & evaluation methods* (pp. 75-142). Sage Publications, Inc.

Patton, M. Q. (2002). Qualitative designs and data collection. In *Qualitative research & evaluation methods* (pp. 207-257). Sage Publications, Inc.

Prapevessis, H., Gaston, A., & DeJesus, S. (2015). The theory of planned behavior as a model for understanding sedentary behavior. *Psychology of Sport and Exercise*, *19*, 23-32. https://dx.doi.org/10.1016/j.psychsport.2015.02.001

Quinney, L., Dwyer, P., & Chapman, Y. (2016). Who, where, and how of interviewing peers: Implications for a phenomenological study. SAGE Open. doi: 10.1177/2158244016659688

Rairden, C. A., Lavin, M. A., & Yun, S. (2015). Improving prediabetes screenings at rural Missouri county health departments. *Journal of Community Health*, *40*(6), 1107-1114.

Rattay, K.T., & Rosenthal, M. (2014). Reversing the diabetes epidemic: A role for primary care in identifying pre-diabetes and referral to an evidence-based program. *Delaware Medical Journal*, *86*(10), 307-313.

Risling, T. (2017). Educating the nurses of 2025: Technology trends of the next decade. *Nurse Education in Practice*, *22*, 89-92. doi:10.1016/j.nepr.2016.12.007

Ritz, E., Zeng, X, & Rychlik, I. (2011). Clinical manifestation and natural history of diabetic nephropathy In K. N. Lai, S.C.W. Tang (Eds.) *Diabetes and the kidney*, 19-27. S Karger AG, Basel.

Roberto, A. J., Shafer, M. S., & Marmo, J. (2014). Predicting substance-abuse treatment providers' communication with clients about medications assisted treatment: A

test of the theories of reasoned action and planned behavior. *Journal of Substance Abuse Treatment, 47*, 307-313. doi: 10.1016/j.jsat.2014.06.002

Rodgers, L., Conrey, E. J., Wapner, A., Ko, J. Y., Dietz, P. M., & Oza-Frank, R. (2014). Ohio primary health care providers' practices and attitudes regarding screening women with prior gestational diabetes for type 2 diabetes mellitus—2010. *Preventing Chronic Disease*, *11*, E213. doi:10.5888/pcd11.140308

Rosenfield, R. M., Shiffman, R. N., & Robertson, P. (2013). Clinical practice guideline development manual, third edition: A quality-driven approach for translating evidence into action. *Otolaryngology-Head and Neck Surgery,* S1-S55. doi:10.1177/0194599812467004

Ryan, A. M., Bishop, T. F., Shih, S., & Casalino, L.P. (2013). Small physician practices in New York needed sustained help to realize gains in quality from use of electronic health records. *Health Affairs*, *32*(1). doi:10.1377/hlthaff.2012.0742

Santana, S. M. P. (2013). Practitioners' use of clinical practice guidelines: An evidence-based approach. UNF *Theses and Dissertations.* Paper 462. https://digitalcommins.unf.edu/etd/462

Scarpello, T. J., Murray, N. J., Maisey, S., Howe, A. C., & Sampson, M. J. (2011). A qualitative assessment of using lay trainers with type 2 diabetes in an intervention programme for people at risk of type 2 diabetes. *Health Education Journal.* doi:10.1177/001789691143052

Schwaiger, C. B., Aruda, M. M., LaCoursiere, S., Lynch, K. E., & Rubin, R. J. (2013). Increasing adherence to cervical cancer screening guidelines. *The Journal for Nurse Practitioners*, *9*(8), 528-535

Shea, C. M., Reiter, K. L., Weaver, M. A., Thornhill, J., & Malone, R. (2015). Associations between practice characteristics and demonstration of stage 1 meaningful use for the electronic health record incentive program. *NC Medical Journal*, *76*(5), 280-285. doi:10.18043/ncm.76.5.280

Sherr, D., & Lipman, R.D. (2013). Diabetes educator's skilled professionals for improving prediabetes outcomes. *American Journal Preventive Medicine*, *44* (4S4), S390-S393.

Sohler, N., Matti-Orozco, B., Young, E., Li, X., Gregg, E. W., Ali, M. K., McKeever B. K., & Albu, J. B. (2016). Opportunistic screening for diabetes and prediabetes using hemoglobin A1C in an urban primary care setting. *Endocrine Practice*, *22*(2), 143-150. doi:10.4158/EP15866.OR

Sommerville, M., Burch, E., Ball, L., & Williams, L. T. (2020). 'I could have made those changes years earlier': Experiences and characteristics associated with receiving a prediabetes diagnosis among individuals recently diagnosed with type 2 diabetes. *Family Practice*, *37*(3), 382-389. doi:10.1093/fampra/cmz081

Stuckey, H. L., Vallis, M., Burns, K. K., Mullan-Jensen, C. B., Reading, J. M., Kalra, S., Wens, J... & … Peyrot, M. (2015). "I do my best to listen to patients": Qualitative insights into DAWN2 (diabetes psychosocial care from the perspective of health care professionals in the second diabetes attitudes wishes and needs study). *Clinical Therapeutics*, *37*(9). 1986-1998. doi:10.1016/jclinthera.2015.06.010

Taghizadeh, Z., Vedadhir, A., Behmanesh, F., Ebadi, A., Pourreza, A., Abbasi-Shavai, M. J. (2015). Reproductive practices by patterns of marriage among Iranian

women: Study protocol for an explanatory mixed methods design. *Reproductive Health*, *12*(89). doi: 10.1186/s12978-015-0080-1

Tapp, H., White, L., Steuerwald, M., & Dulin, M. (2013). Use of community-based participatory research in primary care to improve healthcare outcomes and disparities in care. *Journal of Comparative Effectiveness Research*, *2*(4), 405-419. doi:10.2217/CER.13.45

Tarasova, V. D., Caballero, J.A., Turner, P., & Inzuccha, S. E. (2014). Speaking to patients about diabetes risk: Is terminology important? *Clinical Diabetes*, *32*(2), 90-95.

Towne, S. D., Anderson, K. E., Smith, M. L., Dahlke, D. V., Kellstedt, D., Purcell, N. P., & Ory, M. G. (2015). Changing organizational culture: using the ceo cancer gold standard policy initiatives to promote healthy and wellness at a school of public health. *BMC Public Health*, *15*(853). doi:10.1186/s12889-015-2186-3

Tseng, E., Greer, R. C., O;Rourke, P. O., His-Chen, Y., McGuire, M. M. Clark, J. M., & Maruthur, N. M. (2017). Survey of primary care providers' knowledge of screening for, diagnosing and managing prediabetes. *Journal of General Internal Medicine*, *32*(11) 1172-1178. doi:10.1007/s11606-017-4103-1

United Health Care Services (2017). *United health care, health and wellness programs.* https://www.onenetppo.com/employer/public-sector/government/wellness

U.S. National Library of Medicine. (2015). *Primary care provider*. https://www.nlm.nih.gov

U.S. National Library of Medicine (2017). *Professional development, health Literacy*. https://nnlm.gov/professional-development/topics/health-literacy

Van Name, M. A., Camp, A., Magenheimer, E. A., Fangyong, L. Sziura, J. D., Montosa, A., Paten, A., & Tamborlane, W. V. (2016). Effective translation of an intensive lifestyle intervention for Hispanic women with prediabetes in a community health center setting. *Diabetes Care*, *39*(4), 525-531. https://dx.doi.org/10.2337/dc15-1899

Velez, R. P., Becker, K. L., Davidson, P., & Sloand, E. (2014), A quality improvement intervention to address provider behavior as it relates to utilization of CA-MRSA guidelines. *Journal of Clinical Nursing*, *24*, 556-562. doi:10.1111/jocn.12684

Villani, J., & Mortensen, K. (2013). Patient-provider communication and timely receipt of preventative services. *Preventive Medicine*, *57*, 658-663. doi:10. 1016.jypmed.2013.08.034

Walters, E. L, Reibling, E. T., Wiber, S., Sullivan, A. F., Gaeta, T. J., Camargo, C. A., & Boudreaux, E. D. (2014). Emergency department provider preferences related to clinical practice guidelines for tobacco cessation: A multicenter survey. *Academic Emergency Medicine*, *7*, 785-793. doi:10.1111/acem.12421

Williams, A. J., Glisson, C., Hemmelgarn, A., & Green, P. (2016). Mechanisms of change in the arc organizational strategy: increasing mental health clinicians' ebp adoption through improved organizational culture and capacity. *Administration and Policy in Mental Health and Mental Health Services*. doi: 10.1007/s10488-016-0742-5

Williamson, C., Glauser, T. A., Burton, B. S., Schneider, D., Dubois, A. M., & Patel, D. (2014). Health care provider management of patients with type 2 diabetes

mellitus: Analysis of trends in attitudes and practices. *Postgraduate Medicine*, *126*(3), 145-160. doi:10.3810/pgm.2014.05.2764

World Health Organization (2013). *Transforming and scaling up health professionals' education and training: Annex 1*. World Health Organization Guidelines.

Wyer, P. C., Umacheid, C. A., Wright, S., Silva, S. A., & Lang, E. (2015). Teaching evidence assimilation for collaborative health care (TEACH) 2009-2014: Building evidence-based capacity within health provider organizations. eGEMs (Generating Evidence & Methods to improve patient outcomes): 3 (2). http://doi.org/10.13063/2327-9214-1165

Zhuo, X., Zhang, P., & Hoerger, T. J. (2013). The direct medical costs of treating type 2 diabetes and diabetes complications. *American Journal of Preventive Medicine*, *45*(3), 253-261. doi: 10.1016/j.amepre.2013.04.017

Zohrabi, M. (2013). Mixed method research: Instruments, validity, reliability and reporting findings. *Theory and Practice in Language Studies*, *3*(2), 254-262. doi:10.4304/tpls.3.2.254-262

## Appendix A.

A Copy of the Original Questionnaire adapted for use in this study is on the next page. Permission for use of the questionnaire with acknowledgement and reference was provided. Reference Citation: Basavreddy, A., Dass, A.S., & Naravana, S. (2015). Prediabetes awareness and practice among Indian doctors-a cross-sectional study. *Journal of Clinical and Diagnostic Research*, 8.

**Questionnaire**

| | | |
|---|---|---|
| 1. | Prediabetes is FBS -100mg/dl - 126mg/dl<br>PPBS-140mg/dl - 200mg/dl. | YES / NO |
| 2. | Can prediabetes be reversed to normal | YES / NO |
| 3. | Are there any approved drugs for treating prediabetes | YES / NO |
| 4. | The prevalence of prediabetes in age group of 20-79years is<br>a. 2% b. 5% c. 7.9% d. 8.4% | |
| 5. | Do you routinely screen for prediabetes? | YES / NO |
| 6. | Which age group would you want to screen for prediabetes? | |
| 7. | Mention the age of the youngest patient you have encountered with prediabetes in your practice. | |
| 8. | The most common age group of patients with prediabetes seen in your practice –<br>a. <35yrs b. 35 – 45 yrs c. 46-55yrs d. 56-65 yrs e. >65yrs | |
| 9. | Your preference of treating prediabetes<br>a. Diet and exercise (life style modification-LSM)<br>b. Oral antidiabetic drug (OAD)<br>c. Combined therapy (LSM+ OAD) | |
| 10. | State 3 important dietary advices that you would give. | |
| 11. | Are you concerned regarding hypoglycaemia in treating Prediabetes? | YES / NO |
| 12. | Have you prescribed any OAD for prediabetes? | YES / NO |
| 13. | If yes, mention the duration of administration of OAD. | |
| 14. | Mention the order of preference of OAD.<br>a. Voglibose b. Metformin c. Troglitazone d. Sitagliptin | |
| 15. | Which OAD is well tolerated among your patients? | |

## Appendix B.

1.What are your thoughts and feelings and experiences you have had with Clinical Standards of Care recommended by the American Diabetes Association?

2. What you believe is desirable to be included in clinical guidelines or standards of care? (Carlsen & Norheim, 2008)

3. Describe your level of confidence in the ADA Clinical Standards of care and the evidence behind the recommendations to be used in providing care to patients (Carlsen & Norheim, 2008)

4. Do you intend to use the ADA Clinical Standards of care when providing care to patients in the future and why or why not? (Burgess, Chang, Nakamura, Izmirian, & Okamura, 2016)

5. What are your thoughts and experiences related to using the Standards of Care or evidenced based guidelines? (Burgess, Chang, Nakamura, Izmirian, & Okamura, 2016)

6. Describe how you think using clinical standards of care influences patient outcomes

7. Describe how other people in your work environment expect you to use standards of care

8. How do you feel guidelines impact your professional judgement and impact patient-provider relationship? (Carlsen & Norheim, 2008)

9. Describe barriers to using clinical practice guidelines and what factors help or keep you from using clinical guidelines or evidenced based practices (Carlsen & Norheim, 2008)

10. What do you think would help reduce risk of diabetes in your patient population and what ideas do you have for screening and educating patients?

* Ideas for interview guide adapted for present study from previously published studies as referenced above