Telehealth and its Impact on the Management of Type 2 Diabetes Mellitus

Melissa N. Toulios
TELEHEALTH AND ITS IMPACT ON THE MANAGEMENT OF TYPE 2 DIABETES MELLITUS

by

MELISSA N. TOULIOS, MSN, FNP-C, DNP STUDENT

EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing and Health Professions of Valparaiso University, Valparaiso, Indiana in partial fulfillment of the requirements For the degree of

DOCTOR OF NURSING PRACTICE

2023

Student Date Advisor Date
This work is licensed under a

Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.
DEDICATION

I dedicate this EBP project to my husband, Bill, and our three amazing children, Dino, Fotini, and Athena. Your love and support gave me the drive to achieve this goal and attain my DNP. To my parents, George and Fotini, and to my siblings, Tia, Dina, Marigo and Kosta, thank you for always being steadfast in my life and being present for my children when I had to be absent. Finally, to my beloved uncle Bob, who passed away prematurely from COVID-19 and complications of uncontrolled diabetes and other co-morbid diseases. He was the reason why I chose this EBP project.
ACKNOWLEDGMENTS

I would like to thank my advisor, Dr. Mackenzire Shireman, for always being my guide during this EBP project. Dr. Christina Cavinder for always being so kind and supportive of all your students and to Professor Whalen for all your help during the difficult literature review. To my dearest friends, Dr. Marek Piszczatowski and Dr. Kacy Davis, a big “thank you” for always being a friend and always answering my calls at any time of day or night. To my work staff, I thank you from the bottom of my heart for all your love and support over these past 3 years. I have no words that can further express the gratitude that I have for you all.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>viii</td>
</tr>
<tr>
<td>CHAPTERS</td>
<td></td>
</tr>
<tr>
<td>CHAPTER 1 – Introduction</td>
<td>1</td>
</tr>
<tr>
<td>CHAPTER 2 – EBP Model and Review of Literature</td>
<td>6</td>
</tr>
<tr>
<td>CHAPTER 3 – Implementation of Practice Change</td>
<td>16</td>
</tr>
<tr>
<td>CHAPTER 4 – Findings</td>
<td>20</td>
</tr>
<tr>
<td>CHAPTER 5 – Discussion</td>
<td>25</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>35</td>
</tr>
<tr>
<td>AUTOBIOGRAPHICAL STATEMENT</td>
<td>39</td>
</tr>
<tr>
<td>ACRONYM LIST</td>
<td>40</td>
</tr>
<tr>
<td>APPENDICES</td>
<td></td>
</tr>
<tr>
<td>APPENDIX A – John Hopkins Nursing Evidence</td>
<td></td>
</tr>
<tr>
<td>Based Practice Model Permission</td>
<td>41</td>
</tr>
<tr>
<td>APPENDIX B – PET Process</td>
<td>42</td>
</tr>
<tr>
<td>APPENDIX C- Patient Education Packet</td>
<td></td>
</tr>
<tr>
<td>APPENDIX D – CITI Certificate</td>
<td>43</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 2.3 Summary of Evidence</td>
<td>xi-xii</td>
</tr>
<tr>
<td>Table 4.1 Patient Demographic Data</td>
<td>xxi</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2.1 The John Hopkins Nursing Evidence-Based Practice Model</td>
<td>vii</td>
</tr>
<tr>
<td>Figure 2.2 Prisma Diagram of Literature Search Results</td>
<td>ix</td>
</tr>
<tr>
<td>Figure 4.1 Pre- and Post-Invention Data Outcomes</td>
<td>xxiv</td>
</tr>
</tbody>
</table>
ABSTRACT

Diabetes mellitus type 2 (T2DM) is a growing epidemic that affects millions of people throughout the world. The recent COVID-19 pandemic has created many new challenges, including access to health care for treatment of chronic diseases, such as diabetes (Robson & Hosseinzadeh, 2021). Telehealth has offered a promising approach to improve the management of diabetes (Bellman, 2021). People with diabetes are less likely to manage their diabetes through the usual care because of risk of contracting COVID-19 (CDC, 2022). The purpose of this EBP project was to evaluate the effectiveness of T2DM management through a telehealth approach. This project has addressed the following PICOT question: In patients with diabetes mellitus type 2 who have difficulty with medical visit compliance (P), will the telehealth platform (I), compared to patient’s previous face-to-face visit HgbA1c (C) improve future HgbA1c diagnostic marker readings (O) over a 12-week period (T)? This EBP project took place in a private practice located in the suburbs of Chicago. Twenty-one patients participated in this quality improvement project with an average age of the patients was 53 years of age (SD=11.6). Two-thirds of the participants were self-identified as female (67%, n=14) and one-third were self-identified as being male (33%, n=7). The mean pre-intervention HbA1c 7.9% (SD=1.04%). The median HBA1c was 7.5% (IQR=1.4%). The minimum HbA1c was 6.7% and the maximum pre-intervention HbA1c was 10. The average post-intervention HbA1c was 7.0% (SD=.79%). The median post-intervention HBA1c was 6.9% (IQR=1.3%). A paired t-test was utilized and showed that there was statistical significance in the outcome. The statistical findings indicated that the post-intervention HbA1c was less than pre-intervention HbA1c (p<0.001). A pre- and post-weight were also collected as a secondary outcome. Results of the Wilcoxon signed rank test showed statistical evidence post intervention weight was less than the pre-intervention weight (p<0.001).

Keywords: type 2 diabetes mellitus; hemoglobin, A1c; self-management; usual care
CHAPTER 1
INTRODUCTION

Background

Diabetes mellitus type 2 (DMT2) is a growing epidemic that affects millions of people throughout the world, it is primarily brought on by sedentary lifestyle and poor dietary choices, which leads to obesity and the onset of either pre-diabetes or diabetes (ADA, 2021). Type 2 diabetes (T2DM) is diagnosed by elevated biomarkers, such as fasting blood glucose levels greater than 126mg/dL or with a glycohemoglobin A1c level of greater than or equal to 6.5 percent (ADA, 2021). Diabetes is a chronic disease and if not well controlled can increase overall risk of mortality (ADA, 2021). Evidence supports the link between diabetes and the development of micro- and macrovascular diseases often leading to a shortened life expectancy (Cahyadi et al., 2021; Bellman, 2021; ADA, 2022). Better glycemic control leads to better clinical outcomes and decreases morbidity rates. For example, studies have shown a decrease in macrovascular disease, such as cerebrovascular accidents or myocardial infarctions, if glycemic levels are well-controlled and with a glycohemoglobin A1c of less than 7% percent in patients who are diagnosed with T2DM (Cahyadi et al., 2021).

Treatment for T2DM includes oral and injectable hypoglycemic agents, which can be very costly for patients, but are necessary for treatment. Lifestyle modifications such as dietary changes, exercise, and weight loss have been correlated to improve the glycohemoglobin levels and better glycemic control (ADA, 2021). Traditional treatment or usual care of diabetes mellitus type 2 takes place in the office as a face-to-face encounter. The recent COVID-19 pandemic has created many new challenges, including access to health care for treatment of chronic diseases, such as diabetes (Robson & Hosseinzadeh, 2021). Since the pandemic, primary care providers have had to rapidly offer their care services through some type of remote access, which includes
live video visits, telephone, and web-based applications to improve patient access and outcomes through telehealth services (Robson & Hosseinzadeh, 2021).

Data Supporting Need for the Project

Global, National, Regional, and State Data

The global prevalence of diabetes is estimated to affect 463 million people worldwide, accounts for 95% of the population with diabetes and is estimated to rise to 578 million by the year 2030 (WHO, 2021; Robson & Hosseinzadeh, 2021). The Centers for Disease Control (CDC) (2022) estimates 37.3 million or 11.3% of the population in the United States have been diagnosed with diabetes. The World Health Organization (WHO) (2021) has set a goal to cease the uptick of diabetes by the year 2025. Diabetes is responsible for approximately 1.6 million deaths worldwide in 2016 and remains the nineth leading cause of mortality. The incidence of diabetes continues to climb and has been noted to have a higher prevalence rate in lower income individuals (IDPH, 2021). A Crude Prevalence of Diabetes and Prediabetes Among Adults: Illinois and U.S. in 2019 shows that there has been a significant increase of this disease from 9.5% to 10.7% in one years’ time and it also noted that there was a higher prevalence rate in adults over the age 65 (IDPH, 2021).

The current diabetic endemic has proven that is still a major public health concern because of the comorbid conditions that are caused by this disease. Illinois state data from 2019 shows that 35.7% of adults with diabetes developed coronary heart disease, 33.6% developed a stroke or vascular event, 33.4% developed cardiovascular disease, 24.9% were diagnosed with elevated cholesterol levels, 26.2% had hypertension and 14.3% were either overweight or obese (IDPH, 2021). These comorbid diseases are associated with long-term negative outcomes and if proper management of diabetes is not instilled or proper preventative programs are not initiated to reverse the high prevalence of prediabetes. Data from 2021 in Illinois shows that patients with a history of diabetes are twice as likely to develop severe complications from COVID-19 and three times as likely to die (IDPH, 2021).
Consequently the recent pandemic has created barriers to health care. Telehealth has offered a promising approach to improve the management of diabetes (Bellman, 2021). People with diabetes are less likely to manage their diabetes through the “usual care” because of risk of contracting COVID-19 (CDC, 2022). It is crucial to optimize glycemic control in patients with diabetes because of the comorbid conditions that are associated with this disease and further increased risk of morbidity and mortality, especially during this ongoing pandemic (Eberle, 2021).

Clinical Agency Data

The evidence-based project (EBP) will take place in a small private family practice setting located in Berwyn, which is a suburb of Chicago, Illinois. This free-standing privately-owned clinic has been present in the Berwyn community for over 30 years. Most of the patient population it serves are Hispanic and Bohemian. The primary care providers there are two nurse practitioners and one physician. The ancillary staff is made up of four medical assistants (MAs). The Doctor of Nursing Practice (DNP) student has been employed as a nurse practitioner by this clinic for about 21 years. It is a very busy practice that offers primary care and immediate care services. This clinic sees on average about 50 to 60 patients per day and is open six days a week.

Since it is a primary care office, we treat and manage multiple chronic diseases, including T2DM. Approximately 37% of the patients that are treated in the practice suffer from T2DM. The age range is from 40 to 70 and there are more female than male patients who are diabetic. The physician requires that all the diabetic patients come in routinely every 3 months for fasting labs as well as check-up to ensure that the patients are maintaining the current prescribed regimen. Quality measures are required to be completed at each visit, which are tools that ensure healthcare processes, patient perceptions, outcomes and organize structures or instill systems to be in place for patients to receive high-quality health care, that relate to one or more quality goals (CMS, 2018). A quality measure goal that is necessary in diabetic patients is a hemoglobin A1c (HgbA1c) of less than 7%.

Purpose of the Evidence-Based Practice Project
Purpose Statement and PICOT Question

The purpose of this EBP project is to evaluate the effectiveness of T2DM management through a telehealth approach. Data supports the need for more studies to be conducted to appropriately evaluate the effectiveness of telehealth and management of chronic illness, such as the self-management of T2DM (Hanlon et al., 2017). However, there are several studies that provide data to support the effectiveness of telehealth medicine in patients with T2DM, especially in areas where access to health care is limited (Agastiya et al., 2022; American Diabetes Association, 2022; Pamaiahgari, 2018; Robson & Hosseinzadeh, 2021). This project will answer the compelling question: Can T2DM be effectively managed through a telehealth platform, in a primary care setting? This project will address the following PICOT question: In patients with diabetes mellitus type 2 who have difficulty with medical visit compliance (P), will the telehealth platform (I), compared to patient's previous visit face-to-face HgbA1c (C) improve future HgbA1c diagnostic marker readings (O) over a 12-week period(T)?

EBP Project Description

The electronic medical record system that is currently in use at the practice site has the capability to provide a list of all patients that have a diagnosis or ICD-10 code of E11.9, which is T2DM, without complications. Weekly review with the stakeholders will take place to see which patient will qualify for the EBP project, and each patient will receive a “tickler” notification, which will prompt them to call the office and schedule a face-to-face appointment, for their initial visit. During their first visit, patients will have their fasting labs drawn, particularly serum HgbA1c, and then will be asked to make a follow-up appointment in six weeks via telehealth. A brief education of how to use the telehealth platform will be reviewed and discussed with each patient at the initial visit. Each participant will take part in two six week visit appointments that will be on a telehealth platform. At the end of the 12-week period, the patient will be asked to repeat their HgbA1c. A comparison of the initial and post-intervention HgbA1c will be reviewed to determine if there were any statistically significant changes. The participants’ weight will also be measured.
and collected, for the secondary outcome. Each patient’s weight will be collected both at the pre- and post-intervention check-ins.
CHAPTER 2
EBP MODEL AND REVIEW OF LITERATURE

Evidence-based Practice Model

Overview of EBP Model

Melnyk and Fineout-Overholt (2019) states that EBP is “a problem-solving approach to clinical decision making that incorporates a search for the best and latest evidence, clinical expertise and assessment, and patient preference and values within a context of caring” (p. 149). After a well sought out and thorough review of several EBP models, the John Hopkins Evidence-Based Practice for Nurses and Healthcare Professionals (JHEBP) was found to be the most appropriate choice for this project. Permission for use was granted from the Institute for Johns Hopkins Nursing, which can be found in Appendix A. The JHEBP model will assist in the development, preparation, and execution of this EBP project. It is widely used and a well-known EBP model. This model was also chosen because it is very user friendly. The goal of this EBP model use is to enhance the clinician’s ability to deliver the highest level of care to patients by a comprehensive approach. The effective problem-solving approach is provided through a guide that is broken down into three segments, which are: (1) Practice Question and Project Planning, (2) Evidence, and (3) Translation, also known as the PET Process (Dang et al., 2022).

PET Process Guide

Practice Question and Project Planning is the first segment in the PET Process Guide and contains seven steps that will help guide the EBP project and stay on task. These seven steps are: (1) recruit interprofessional team, (2) determine responsibility for project leadership, (3) schedule team meetings, (4) clarify and describe the problem, (5) develop and refine the EBP question, (6) determine the need for an EBP project, and (7) Identify stakeholders (Dang et al., 2022). The second segment of this guide is Evidence and has steps 8 through 12. They are:
(8) conduct internal and external search for the evidence, (9) appraise the level and quality of each piece of evidence, (10) summarize the individual evidence, (11) synthesize findings, and (12) develop best evidence recommendations (Dang et al., 2022). Translation is the final phase and steps 13 through 20 are as follows: (13) Identify practice setting-specific recommendations, (14) create action plan, (15) secure support and resources to implement action plan, (16) implement action plan, (17) if change is implemented, evaluate outcomes to determine if improvements have been made, (18) report results to stakeholders, (19) identify next steps, and (20) disseminate findings (Dang et al., 2022).

**Figure 2.1**

*The Johns Hopkins Nursing Evidence Based Practice Model for Nurses and Professionals Model*

![Image of the Johns Hopkins Nursing Evidence Based Practice Model](image)

*Note: The Johns Hopkins Nursing Evidence-Based Practice Model was used with permission from the Johns Hopkins Hospital and Johns Hopkins University School of Nursing. (see Appendix A for permission statement)*

**Literature Search**

**Sources Examined for Relevant Evidence**

A comprehensive and exhaustive literature search was conducted through the library databases, including Joanna Briggs Institute (JBI), Cochrane, Cumulative Index of Nursing and
Allied Health Literature (CINAHL), PUBMED, and Turning Research Into Practice (TRIP) (Table 2.3). The research that was performed included a combination of keywords ("Type 2 diabetes" OR "diabetes mellitus type 2") AND (hemoglobin OR A1c) AND (self-management OR "self management"). The inclusion criteria included peer reviewed journals published in the English language, within the past five years. The use of a Boolean for truncation of words such as “diabet*” was applied to the search which resulted in an increase in results. Articles that did not include “ehealth” or “telehealth” or “telemedicine” were excluded.

A total of 378 articles were yielded from the literature search, including a hand search of journal article diabetes. Three hundred sixty-four articles were found to be irrelevant to the project and therefore excluded. There were 14 articles there included after a thorough review of the abstract. Each article was appraised using the JHEBPM for Nursing evidence appraisal tool (Dang et al., 2022). Permission for use of the JHEBPM for Nursing tool was obtained as noted previously.

The Prisma in figure illustrates the literature search.
Figure 2.2

PRISMA Diagram of Literature Search Results

Identification of studies via databases and registers

<table>
<thead>
<tr>
<th>Records identified from*:</th>
<th>Records removed before screening:</th>
</tr>
</thead>
<tbody>
<tr>
<td>JBI (n=43)</td>
<td>Records removed for other reasons (n = 367)</td>
</tr>
<tr>
<td>Cochrane, (n=45)</td>
<td></td>
</tr>
<tr>
<td>CINAHL (n=62)</td>
<td></td>
</tr>
<tr>
<td>PUBMED: (n=131)</td>
<td></td>
</tr>
<tr>
<td>Trip (n=60)</td>
<td></td>
</tr>
<tr>
<td>Databases (n = 5)</td>
<td></td>
</tr>
<tr>
<td>Records identified from hand search (n=1)</td>
<td></td>
</tr>
<tr>
<td>Records identified from citation chasing (n = 19, 1)</td>
<td></td>
</tr>
</tbody>
</table>

Records screened (n = 125) (n = 80)

Reports sought for retrieval (n = 45)

Reports assessed for eligibility (n = 17)

Reports excluded:
- Full text not available (n = 2)
- Intervention unrelated (n = 1)
  etc.

Records excluded** (n = 25)

Studies included in review (n = 14)
Levels of Evidence

The level of evidence for all articles were rated using the hierarchy from Melnyk and Fineout-Overholt (2019). There are 14 articles that have been selected for this project. Each article met the hierarchy of evidence that is based on the seven levels of the hierarchy pyramid (Melnyk & Fineout-Overholt, 2019). Level-I is the highest level of evidence and includes evidence from Systematic Reviews (SR), and Clinical Practice Guidelines (CPGs). Level-II is the second highest in the pyramid and consists of high quality Randomized Controlled Trials (RCTs). Level-III of the hierarchy includes quasi-experimental and non-randomized control trials. Level-IV consists of case-control and cohort studies. Level-V includes systematic reviews of a descriptive or qualitative studies. Level-VI articles of which there are only a single descriptive qualitative study and level-VII is the lowest level of the pyramid and are articles that consist of expert opinion (Melnyk & Fineout-Overholt, 2019).

Appraisal of the 14 pieces of evidence were appraised using the JHEBPM for Nursing. The articles that were found to be of high quality or a Level-IA are the four meta-analyses of systematic review (SR) articles (Agastiya et al., 2022; Eberle & Stichling, 2021; Hanlon et al., 2017; McLendon, 2017; So & Chung, 2018), one randomized prospective study (Storch, et al., 2019) and one CPG (ADA, 2022). There are two evidence summaries (Bellman, 2022; Pamaiahgari, 2018) that were included in this EBP were also a Level-IA. One meta-analysis of an randomized control trial (RCT) (Robson & Hosseinzadeh, 2021) that were selected for this EBP project was appraised and received a rating of Level-IA. Two RCTs (Gupta, et al., 2020; Lee, et al., 2019) received a grading of Level-IIA. The final article included in this EBP project is a qualitative study (Lee et al., 2019) and received a Level-V, but was included because it is a perspective study that was found to be relevant for the purpose of this project. The final 14 pieces of evidence that have been included for this EBP project are described in Table 2.3 and the appraised value.
Analysis and Appraisal of Relevant Evidence

The quality of the pieces of evidence were appraised using the JHEBPM for Nursing. The purpose of the appraisal tool was selected for use because it satisfies the requirements of the hierarchy of evidence (Dang, et al., 2022). This tool was selected to evaluate the validity and strength of the articles included in this EBP project. JHEBPM for Nursing consists of various questions on a checklist requiring a response of “yes” or “no” and some questions offer a response of “n/a” (Dang et al., 2022). Grades of A (high), B (good), or C (low) quality were assigned to the articles that were appraised using the JHEBPM for Nursing.

Refer to the table. Also, this is where you refer to the Evidence Table in the Appendix. Here is an example using APA format:

Table 2.3

Summary of Evidence

<table>
<thead>
<tr>
<th>Author/yr</th>
<th>Database(s)</th>
<th>Level of Evidence/Type</th>
<th>Quality/Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADA (2022)</td>
<td>TRIP</td>
<td>I/CPG</td>
<td>High/John Hopkins</td>
</tr>
<tr>
<td>Agastiya et al. (2018)</td>
<td>PubMed</td>
<td>I/SR</td>
<td>Good/Johns Hopkins</td>
</tr>
<tr>
<td>Bellman (2022)</td>
<td>JBI</td>
<td>I/Summary</td>
<td>High/John Hopkins</td>
</tr>
<tr>
<td>Eberle &amp; Stichling (2021)</td>
<td>CINAHL</td>
<td>I/SMR</td>
<td>High/JohnHopkins</td>
</tr>
<tr>
<td>Gupta et al. (2020)</td>
<td>PubMed</td>
<td>I/RCT</td>
<td>High/John Hopkins</td>
</tr>
<tr>
<td>Hanlon et al. (2017)</td>
<td>PubMed</td>
<td>I/SMR</td>
<td>Good/John Hopkins</td>
</tr>
<tr>
<td>Lee et al. (2020)</td>
<td>CINAHL</td>
<td>V/Qualitative</td>
<td>Good/John Hopkins</td>
</tr>
<tr>
<td>Lee et al. (2020)</td>
<td>PubMed</td>
<td>II/RCT</td>
<td>Good/John Hopkins</td>
</tr>
<tr>
<td>McLendon (2017)</td>
<td>ADA</td>
<td>I/SR</td>
<td>High/John Hopkins</td>
</tr>
</tbody>
</table>
Evidence shows that interventions related to telehealth, when in-person or usual care encounters are unattainable, have improved patient outcomes related to a lowering effect of hemoglobin A1c (hgbA1c) and fasting glucose levels as well as overall improved lifestyle (ADA, 2022; Agastiya et al., 2022; Bellman, 2022; Eberle & Stichling, 2021; Gupta et al., 2020; Hanlon et al., 2017; Lee et al., 2019; Mclendon, 2017; Pamaiahgari, 2018; Robson & Hosseinzadeh, 2021; Storch et al., 2019). The recent pandemic has forced change in primary care and has also expanded healthcare access to patients that are either homebound or live in a rural area and access to a primary care provider is limited.

**Telehealth**

As of recent months, an innovative approach to traditional treatment of chronic diseases, such as T2DM, has become the modern way to clinically manage patients (McLendon, 2017). Sessions that were scheduled routinely every six weeks for a duration of six to twelve months showed a significant change in the reduction of the HgbA1c marker (Eberle, 2021; Agastiya et al., 2022; Gupta et al., 2020; Hanlon et al., 2017; Lee et al., 2019; So & Chung, 2018).

Telehealth implementation has posed a challenge to many clinics as it requires a change to the usual method of practice. Electronic Medical Record (EMR) systems have conformed to improve access to many patients to avoid gaps in care (Lee et al, 2019; Robson & Hosseinzadeh, 2021).
Interactive strategies by ways of telehealth, have improved communication between the provider and patients (ADA, 2022).

Barriers to telehealth include patients with a lower level of education, elderly and those who are unskilled (Agastiya et al., 2022). Other barriers that affected the implantation of telehealth to practice included end-user acceptance of the telehealth platform, limited internet access secondary to rural region and cost (Lee et al., 2019). Many EMR companies have benefited financially by offering a telehealth platform. Small private practices have had to incur the cost of telehealth implementation, which has posed an obstacle for many providers (Agastiya et al., 2022; Lee et al., 2019).

**HgbA1c/Fasting Glucose/Self-Monitoring**

Telehealth monitoring has also benefacted the ability to improve fasting glucose levels by ways of self-management (Robson & Hosseinzadeh, 2021). Video visit platforms allow the provider to coach patients and encourage active involvement in their care (Lee et al., 2019). Improvements in patients’ ability to self-manage their behavior can be a crucial factor in the prognosis and risk reduction in the development of diabetes-related complications (Storch et al., 2019). A decrease in the HgbA1c marker has been tied to improved self-management of diabetes (Storch et al., 2019). A reduction in the HgbA1c significantly reduces the risk for development of complications tied with diabetes (ADA, 2022; Storch et al., 2019). Many of the studies included in this EBP project show that live video visits have reduced the HgbA1c marker as compared to usual care (Agastiya et al., 2022; Bellman, 2022; Gupta et al., 2020; Hanlon et al., 2017; Lee et al., 2019; Mclendon, 2017; Pamaiahgari, 2018; Robson & Hosseinzadeh, 2021; Storch et al., 2019). The study by Eberle & Stichling, (2021) states that telemetric interventions have statistically improved the HgbA1c over a 6-month duration. The HgbA1c was compared to the usual care group and had values of -1.15% and -0.25% or a reduction of the HgbA1c by a mean of 0.43% overall (Eberle & Stichling, 2021).

**Lifestyle Modifications**
The ADA (2022) suggests that a successful approach to the management of diabetes is to reduce or prevent the risks of developing associated comorbidities and improve patient outcomes. The Diabetes Prevention Program (DPP) consists of an intensive lifestyle behavior change program that includes a decrease in overall body weight and increase in physical activity of at least 150 minutes per week (ADA, 2022; CDC, 2022; IDPH, 2021). A patient-centered approach, through the use of a telehealth platform, to improve the progression of hyperglycemia, reduction in associated comorbidities and decrease in body weight can be achieved in primary care offices (ADA, 2022; CDC, 2022; IDPH, 2021; So & Chung, 2018).

Primary care providers can provide education in self-management to patients who are diagnosed with T2DM. In many rural areas, where health care access is limited, the primary care provider can use the telehealth platform to further educate and promote better disease management and decrease rate of hospitalizations and complications associated to uncontrolled diabetes mellitus type 2 (So & Chung, 2018). Live video and audio telehealth visits have also proven their effectiveness in lifestyle or behavioral modifications, by ways of providing nutritional support, enhances compliance, and empowering patients to better understand their disease (Eberle & Stichling, 2021).

**Recommendation for Best Practice**

Based on the synthesis of the evidence, telehealth intervention has proven to be an effective platform, in multiple studies to reduce the HgbA1c marker, improve self-management, and promote lifestyle changes (ADA, 2022; Agastiya et al., 2022; Bellman, 2022; Eberle & Stichling, 2021; Gupta et al., 2020; Hanlon et al., 2017; Lee et al., 2019; Mclendon, 2017; Pamaiahgari, 2018; Robson & Hosseinzadeh, 2021; Storch et al., 2019). Therefore, it is recommended that Advanced Practice Nurses (APNs) and other health care providers implement telehealth into their current practice to improve gaps in care. Secondly, the benefits of telehealth implementation have improved access to health care, and decreased health care disparities, especially in communities where care is limited. Risk reduction by way of self-management and
lifestyle modifications, that also promote weight loss, have decreased the development of associated comorbid diseases and improved overall outcomes (ADA, 2022; Eberle & Stichling, 2021).
CHAPTER 3
IMPLEMENTATION OF PRACTICE CHANGE

The recent COVID-19 pandemic has created new challenges to health care in the treatment of many chronic diseases. A review of the literature provides supportive evidence that telehealth can offer many beneficial approaches to the management of chronic diseases, particularly T2DM. The ADA (2022) recommends a visit frequency of every three months to properly treat and manage patients with T2DM. Patients with T2DM are at a higher risk of developing complications to COVID-19 if contracted (CDC, 2022; IDPH, 2021). This pandemic has created gaps in the management of T2DM due to limited access to healthcare.

Participants and Setting

Setting

The EBP project took place in a private practice located in Berwyn, Illinois. It consists of a total of three providers, one physician, and two NPs. The project leader (PL) will be a DNP student with 19 years of nursing experience and has been a family nurse practitioner for 13 years. The PL worked closely with the clinic coordinator and the second NP. The clinic manager also incorporated a separate schedule in the EMR system that was primarily used for this EBP project. This was performed to avoid any confusion during the scheduling process.

Participants

The participants for this EBP project were recruited during their normal routine visits that occur every three months. The targeted population were patients that had a hgbA1c of greater than 6.7%. The initial project sample size was 26 participants, however, due to exclusion criteria and patients that no longer wished to participate, the final number of participants was 21. Most of
the participants were women, this figure is based on the current demographics of my current patients and EMR report. The age of each participant included in this project was greater than 35. These participants were also on multiple medications, which included Metformin, Glucagon-Like Peptide-1 (GLP-1s), and sodium-glucose co-transporter 2 (SGLT2s).

**Pre-Intervention Group Characteristics**

The practice identified over 350 patients with an ICD-10 code of E11.9. A report was generated for review of inclusion and exclusion. A review of recent labs and previous visits was performed. Patients with a HgbA1c of 6.6% or less were excluded from the project. Anyone under the age of 35 was also excluded from the EBP project. Men and women over the age of 35 diagnosed with T2DM, and already on treatment, were selected. These patients are seen regularly in a primary care setting in a suburb of Chicago that is predominantly Hispanic. Demographics include age, race, and insurance information. Out of the 21 patients, approximately 67% of patients are female and 33% are male. In total 53% are Hispanic (n=11), 29% are Caucasian (n=6), and 19% are black or African American (n=4). Many of the participants were either commercially insured (n=10), enrolled in Medicare (n=3) or insured with Medicaid (n=8).

**Intervention**

The intervention that took place was a brief initial face-to-face visit and at that point the patient’s serum hgbA1c was drawn. Education on the use of the telehealth platform was also performed. After the brief visit, the patient was asked to schedule a telehealth visit to follow-up with the PL in six weeks. Each participant was required to set up two six-week follow-up visits. The last appointment that transpired was conducted via a telehealth platform. After the telehealth visit, the patient was asked to return to the clinic fasting to collect the post-intervention hgbA1c. There was a comparison of the pre- and post-intervention HgbA1c, and weight performed.
A scripted detail of questions was asked of each participant during the intervention. This included an assessment of the clinical labs, medication adherence, self-management and lifestyle modifications were reviewed and addressed with each patient. Each visit was approximately 25 minutes in length. A diabetes education packet was compiled and customized to each participant. These packets were provided from the following pharmaceutical companies: Lilly, Novo Nordisk, and Boehringer Ingelheim (Appendix C). The goal of the packet was to promote lifestyle changes and improved self-management, which is consistent with the literature, is to encourage lifestyle changes and improve self-management, to reduce the hgbA1c, and other co-morbid risk factors associated with T2DM (ADA, 2022; Agastiya et al., 2022; Eberle & Stichling, 2021).

Comparison

As noted above, a pre- and post-intervention hgbA1c marker was collected from the fasting participants. The patient’s weight was also measured and collected at the pre- and post-intervention stages. Compliance with visits has negatively affected the management in DM2 care in primary care management, that has worsened since the pandemic. Per the ADA (2022) guidelines, hgbA1c should be measured every 12-weeks in a diabetic patient, to measure the effectiveness of the current treatment plan.

Outcomes

The hgba1c was the primary outcome measurement. This measurement is the “gold standard” in assessing the effectiveness in T2DM care (ADA, 2022). The secondary outcome for this EBP project was to decrease body weight, improve self-management, which includes compliance, and to promote lifestyle or behavioral changes. Evidence supports that proper self-management, which includes weight loss, and lifestyle changes is clinically linked to a reduction in the hgbAc1c and other associated co-morbid conditions (Eberle & Stichling, 2021).

Time
World Diabetes Day is November 14, 2022, however due to time constraints of this EBP project, the project commenced on August 26, 2022. The project was outlined using the PET Process guide (Appendix B). The first set of live video and audio telehealth visits were scheduled during the week of October 4, 2022, and the second set of telehealth visits were scheduled accordingly after the week of November 18, 2022, that follows the ADA’s (2022) practice recommendations. Once the final telehealth visit was completed, each participant was then scheduled for their post-intervention serum hgbA1c and weight collection. The JHNEBP Model uses evidence to translate into best practice within practice improvements such as this implementation of this intervention in the primary care setting.

Protection of Human Subjects

This DNP student completed the Collaborative Institutional Training Initiative (CITI) training (see Appendix D) on March 24, 2021. The EBP project took place in a private practice clinic and due to the nature of the project was exempt from Institutional Review Board (IRB) approval. Verbal consent to participate in this EBP project was obtained and documented in each participant’s medical record by the PL. This intervention is an evidence-based practice change, and the PL provided each participant with a complete format of the live audio and telehealth visit. Each chart was audited on site in the clinic where the project took place that was only available to this PL. During the time of the audits, patient data was secured in a password protected EMR prior to analyses. Outcome data was reported only in a collective form; no identifiable information regarding any patient was released or disclosed. All data was then collected from the medical record and was transferred into the PL’s private computer. The PL’s device requires a secure password to access and is also fingerprint protected. The data was encrypted and stored in a password-protected storage file.
CHAPTER 4

FINDINGS

The purpose of this EBP project was to measure the efficacy of telehealth medicine in the treatment and management of T2DM. Participants were provided with nutritional information and encouraged behavioral modifications to promote a healthy lifestyle. The primary outcome was to see if there was a decrease in the HgbA1c over the span of 12 weeks. The secondary outcome was to determine if there was any weight loss associated with the prescribed medications and lifestyle modifications.

Participants

Of the 26 participants who had agreed to participate in the EBP project, 21 completed the project. There was a total of five patients (19%) lost to attrition. One of the participants no longer had insurance coverage and the four remaining individuals decided to no longer participate in the evidence-based project. The average age of the patients was 53 years of age (SD=11.6). The median age was 54 years of age (IQR=17). The minimum age was 31 and the maximum age of a patient was 70. Two-thirds of the sample self-identified as female (67%, n=14) and one-third of the sample self-identified as male (33%, n=7).

A little over half of the patients self-identified as being Hispanic (52%, n=11), six patients (29%, n=6) self-identified as Caucasian, and four self-identified as being African American (19%, n=4). Almost half the patients reported having private insurance (48%, n=10), eight patients (38%, n=8) reported being on Medicaid, and three patients (14%, n=3) reported having Medicare as their primary insurance (See table 4.1). Each of the participants were screened based on their hgbA1c. Any participant with a hgbA1c of 6.7% or higher were included in the evidence-based project.
Table 4.1

*Patient Demographic Data (N=21)*

<table>
<thead>
<tr>
<th>Demographic</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>11</td>
<td>(52%)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>6</td>
<td>(29%)</td>
</tr>
<tr>
<td>African American</td>
<td>4</td>
<td>(19%)</td>
</tr>
<tr>
<td><strong>Insurance:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>10</td>
<td>(48%)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>8</td>
<td>(38%)</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>(14%)</td>
</tr>
<tr>
<td><strong>Age:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>3</td>
<td>(14%)</td>
</tr>
<tr>
<td>40-49</td>
<td>5</td>
<td>(24%)</td>
</tr>
<tr>
<td>50-59</td>
<td>6</td>
<td>(29%)</td>
</tr>
<tr>
<td>60-69</td>
<td>6</td>
<td>(29%)</td>
</tr>
<tr>
<td>70-79</td>
<td>1</td>
<td>(4%)</td>
</tr>
<tr>
<td>80+</td>
<td>0</td>
<td>(0%)</td>
</tr>
<tr>
<td><strong>Sex:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-identified Female</td>
<td>14</td>
<td>(67%)</td>
</tr>
<tr>
<td>Self-identified Male</td>
<td>7</td>
<td>(33%)</td>
</tr>
</tbody>
</table>
Changes in Outcomes

The primary outcome of this evidence-based project was to measure the effectiveness of the telehealth platform in a family practice setting. This EBP project answered the PICOT question: In patients with diabetes mellitus type 2 who have difficulty with medical visit compliance, will the telehealth platform, compared to the patient's previous visit face-to-face HgbA1c improve future HgbA1c diagnostic marker readings over a 12-week period? The outcome measured the change in the participant’s hgba1c and was collected during their pre-intervention visit. A second hgba1c was collected post-intervention. The secondary outcome measured the change in the participant’s weight, which was collected and recorded at the pre-and post-intervention stage of the EBP project. Literature supports the correlation between weight loss and a lower hgba1c in T2DM patients (ADA, 2021; CDC, 2022; IDPH, 2021).

Statistical Testing and Significance

Data entry was collected and entered into SPSS software. This student worked with a well-known statistician, Gregory Gilbert, to analyze the statistical data. Owning to the dependence of the data and the hypothesis under the interest of this EBP project, this student used a one-sided test (paired t test, Wilcoxon signed rank test, or sign test) to identify the impact of the pre- and post-intervention on the HbA1c and weight of the participants (Arbuthnot, 1710; Student, 1908; Wilcoxon, 1945). The one-sided paired t-test detects an increase (or decrease) in means, the Wilcoxon signed rank test examines a shift (increase or decrease) in location due to the intervention in dependent data, and the sign test detects a shift in medians between paired samples (Hollander & Wolfe, 1999). The pre-intervention and post-intervention HbA1c difference was judged to be normally distributed by tests (Anderson-Darling: p=0.270; Shapiro-Francia: p=0.094; and Shapiro-Wilk: p=0.259) and visually. The secondary outcome measured the difference in the weight, which was judged to be not normally distributed by tests (Anderson-Darling: p<0.001; Shapiro-Francia: p=0.002; and Shapiro-Wilk: p=0.002) and visual inspection;
however, skewness and kurtosis were not greater than |2| therefore the Wilcoxon signed rank test was used to assess the pre-intervention and post-intervention differences.

**Findings**

**Primary Outcome**

The mean pre-intervention HbA1c 7.2% (SD=1.91%). The median HBA1c was 7.6% (IQR=1.4%). The minimum HbA1c was 6.5% and the maximum pre-intervention HbA1c was 14%. The average post-intervention HbA1c was 7.0% (SD=.79%). The median post-intervention HBA1c was 6.9% (IQR=1.3%). Post-intervention scores were, on average, 0.9% less than pre-intervention scores. As the pre- and post-intervention differences were judged to be normally distributed, a paired t-test was used to assess whether there was statistical evidence the average post-intervention HbA1c was less than the average pre-intervention HbA1c. There was statistical evidence post-intervention HbA1c was less than pre-intervention HbA1c (p<0.001). The Common Language Effect Size was 0.73. Somewhat stronger than what was seen for weight. This can be interpreted as if HbA1c values were randomly selected. Almost three out of four participants’ hgbA1c would be less than their pre-intervention HbA1c at the end of the 12 weeks. This was found to be a substantial and clinically important difference.

**Secondary Outcome**

The average pre-intervention weight was 217 pounds (SD=59.3 lbs). The median pre-intervention weight was 212.2 lbs. (IQR=63.9 lbs.) with a minimum of 149 lbs. and a maximum of 351 lbs. The average post-intervention weight was 214 lbs. (SD=53.7 lbs.). The median post-intervention weight was 200.2 lbs. (IQR=54 lbs.). The minimum post-intervention weight was 143 lbs and the maximum post-intervention weight was 344 lbs. The post-intervention weight was, on average, seven pounds lower than the pre-intervention weight. Results of the Wilcoxon signed rank test showed statistical evidence post-intervention weight was less than the pre-intervention weight (p<0.001). The Common Language Effect Size was 0.52. In other words, if we randomly
sampled the post-intervention scores, this student could only expect 52% of the post-intervention weight scores to be less than the pre-intervention scores.

Figure 4.1
During the recent pandemic, many patients chose to not see their healthcare providers for fear of unnecessary exposure and contraction of the COVID-19 virus. Many healthcare practices moved to the telehealth platform to improve access and avoid gaps in patient care. It is recommended by the ADA (2022) that in combination with medication compliance, lifestyle modifications and weight loss, patients with T2DM should have their HgbA1c monitored every 3 months to evaluate effectiveness of their current regimen. The purpose of this project was to
examine if live video and audio telehealth visits could effectively treat patients with T2DM in the family practice setting. The PL conducted an extensive literature review to identify the most current evidence-based practice to support the need to improve the current clinical practice and patient outcomes with the implementation of telehealth visits in primary care. This EBP project answered the following PICOT question: (P) In patients with diabetes mellitus type 2 who have difficulty with medical visit compliance, (I) will the telehealth platform, (C) compared to patient’s previous visit face-to-face HgbA1c (O) improve future HgbA1c diagnostic marker readings (T) over a 12-week period?

**Explanation of Findings**

**Primary Outcome**

The findings from this EBP project supported the effectiveness of implementing telehealth visits to treat patients with T2DM in primary care. Visits were compiled of two six-week visits, that were based on the recommendation in the literature. An initial HgbA1c and weight were collected and recorded from the patient’s previous face-to-face visit. The results of the project showed a significant decrease from the patient's pre-intervention HgbA1c average of 7.2% (SD=1.91%) with a median HgbA1c value of 7.6% (IQR=1.4%). The post-intervention average HbA1c was 7.0% (SD=.79%). The median post-intervention HBA1c was 6.9% (IQR=1.3%). Post-intervention scores were, on average, 0.9% less than pre-intervention scores. The results seen in this EBP project were consistent with findings from the literature that provided supportive evidence (ADA, 2022; Agastiya et al., 2022; Bellman, 2022; Eberle & Stichling, 2021; Gupta et al., 2020; Hanlon et al., 2017; Lee et al., 2019; Mclendon, 2017; Pamaiahgari, 2018; Robson & Hosseinzadeh, 2021; Storch et al., 2019).

Upon review of the recent literature, further evidence supports that the management of T2DM found that the participants had a significant decrease in their HgbA1c, compared to the usual care visit or in-person visit, over the span of 6-12 months (Mabeza, Maynard, & Tarn, 2022). In 2023, the ADA made an updated statement regarding telehealth along with its
utilization to improve patient outcomes. The telehealth platform should be used in conjunction with in-person visits to improve glycemic management in patients with T2DM (ADA, 2023). There has been an increase in the literature that provides further supportive evidence regarding the need for telehealth implementation in primary care practices (ADA, 2023; Maza, Maynard & Tarn, 2022). Various telehealth platforms have been found to effectively reduce the HgbA1c in patients with T2DM compared to patients who have been treated with usual care (ADA, 2023). The ADA (2023) also states that not only is this treatment modality effective, but it has also been found to deliver safe and effective care in this patient population.

**Secondary Outcome**

The secondary outcome of the project was to measure if there was a reduction in weight as a result of medication compliance, and prescribed lifestyle modifications, which includes daily exercise. The statistical analysis validated the effectiveness of the telehealth intervention that was implemented in the targeted population. Patients’ weights were measured in the clinic and recorded by the assigned medical assistant, to ensure validity of the results. The average pre-intervention weight was 217 pounds (SD=59.3 lbs). The median pre-intervention weight was 212.2 lbs. (IQR=63.9 lbs.). The average post-intervention weight was 214 lbs. (SD=53.7 lbs.). The median post-intervention weight was 200.2 lbs. (IQR=54 lbs.). The post-intervention weight was, on average, seven pounds lower than the pre-intervention weight. Patients also reported an increase in energy and a decrease in mood behaviors due to weight loss and dietary changes. New data supports that telehealth platforms tailored to the patient’s needs during the treatment of T2DM have shown an improvement in the social-emotional well-being of the patient (ADA, 2023).

**Strengths and Limitations of the DNP Project**

**Strengths**

There were many different strengths that were identified during this EBP project. One of the most significant strengths that were identified was the need to implement this EBP project in
this patient population in a family practice setting. The literature supports that because of COVID-19, the telehealth application quickly became an approved format to implement into practice for primary care providers, thus minimizing any gaps in treatment (Ju, 2020). There have been conscious efforts among multiple disciplines to incorporate telehealth in the regular day-to-day operations in the clinic setting (Ju, 2020; Mabeza et al, 2022). Nurse Practitioners (NPs) were also granted approval by the Centers for Medicare and Medicaid Services to provide care through live audio and video telehealth visits (Ju, 2020).

Medicare also authorized that telehealth visits billed with appropriate Current Procedural Terminology (CPT) or Healthcare Common Procedure Coding System (HCPCS) codes, be reimbursed at the same rate as the in-person office visit (Health Resources & Service Administration, 2023; Ju, 2020). An additional strength that was noted was that the reimbursement rate matched the in-person visits, which made scheduling patients for the project more cost-effective. It was recognized that during EBP project implementation phase there would not be any loss of revenue for the practice.

A final strength that was identified was that the current EMR system offers a telehealth platform, which is conducive during the scheduling and intake process. This EMR system offered a user-friendly approach during the telehealth visits, which decreased patient anxiety before, during, and after each visit. Despite the office suffering a staffing shortage, the medical assistants were able to effectively schedule each visit in between the regular in-person visits that were being seen by the PL. Many of the participants did acknowledge the comfort and ease of use during the live audio and video visit.

Limitations

During the project there were some limitations that were encountered, one that caused the most strain for the PL was staffing shortage. There were two employees that unfortunately left the practice for personal reasons, forcing the PL to perform all the searches and data
collection on her own. Each participant that enrolled in the project was scheduled by the PL. This process included demographic data verification and a review of the patient’s previous face-to-face HgbA1c. This process became very taxing on the PL during this review and schedule process.

Initial anxiety from elderly patients was also an additional limitation that was identified. The PL also noted that the patient’s low level of education and unskilled level of understanding created a struggle for some of the participants to use the telehealth platform. During this time the PL had to perform return demonstrations with each of the patients that had more difficulty. This ensured that the participant developed a clearer understanding of the technology being used. The data from the literature also identified similar limitations, particularly the unskilled and elderly patients (Agastiya et al., 2022).

Medication coverage and availability also posed to be an issue for this EBP project. Each patient’s coverage varied and did not ensure that each patient would be treated with the same medication or pharmacological class. Recently the ADA (2023) updated their treatment guidelines to include the Glucagon-Like Peptide-1 (GLP-1) and Sodium-Glucose Cotransporter-2 Inhibitor (SGLT2) for an effective HgbA1c drop, and a decrease in overall body weight. A national medication shortage of semaglutide created a barrier as well as a limitation to treat each patient as recommended in the guidelines. The reason for the shortage was due to sudden popularity of the GLP-1 class of medications, that were being prescribed by other providers for weight loss treatment. This PL had to work diligently with the clinic coordinator to complete prior authorizations for insurance approval of the medications. Due to the shortage, some patients were provided with a professional sample of the medication for the month until their insurance authorized the use of the medication.

**Sustainability**

The actions taken to sustain this EBP project implementation were to ensure beneficial outcomes for patients with chronic diseases, such as T2DM. Every key stakeholder had to be
trained in the implementation process once the staffing shortage improved. All result findings from this evidence-based project were disseminated to the providers in the clinic and the entire medical staff. The evidence was reviewed and discussed with the outcomes with key stakeholders, who agreed with the clinical findings. Implementation of this project did create some workflow disruption but was easily adapted after each staff member received the proper training, provided by the EMR’s technical support system. This EBP project aligned with this clinical practice’s overall goal for patient care, which was to provide an alternative format to improve patient care or access for treatment of their chronic illnesses. This goal was achieved successfully and has been incorporated into the normal day-to-day provider’s schedule. An added benefit, that is currently being reviewed by the key stakeholders and clinical staff, is to increase provider satisfaction by offering a work from home opportunity one or two days per week for each clinical provider. Expansion of this project to treat patients who live in a different state or in rural areas, will benefit from this platform, as stated in the literature (Agastiya et al., 2022; Pamaiahgari, 2018; Robson & Hosseinzadeh, 2021).

If ever given the opportunity to redo this EBP project this PL would have had two separate groups. One group would have been the control or telehealth group and the second or the comparison group would have been the in-person visits. Another recommendation that would have been beneficial to this EBP project, was to include any T2DM with a HgbA1c of 6.5% or higher, instead of 6.7% or higher. The reason for this was to limit the sample size of the project. Ultimately, this PL was satisfied with the outcome of this evidence-based project.

**Relevance for EBP Model**

For this evidence-based project the JHNEBP model was chosen based on its three-step process. This process, which includes the practice question, evidence selection, and translation, is known as the PET process. The JHNEBP model was the guide for clinical problem-solving and offered a user-friendly tool for use (Dang & Dearholt, 2017). Using the JHNEBP model, the
PL was able to identify the need for the EBP project. Following the work plan that was provided to the PL offered a step-by-step approach on developing the PICOT question, need for the EBP project, conducting research and dissemination of the findings. The question development tool was a guide to formulate the PICOT question for this evidence-based project. Key stakeholders were identified, including a physician, nurse practitioner, medical assistants, and patients. Multiple meetings and discussions took place throughout the EBP project. A discussion of each individual’s role, need for change with supporting evidence and an open forum for questions or concerns occurred. An initial list of eligible patients was generated, then followed by review of the medical chart.

During the evidence phase the collection of supporting literature, appraisal, and synthesis took place. A large-scale search was conducted to gather the most up-to-date and relevant supporting evidence for this EBP project. The literature was then appraised with the use of the JHNEBPM research appraisal tool. Evidence was then synthesized using the synthesis and recommendations tool. This tool was utilized to evaluate if the evidence provided consistent, and high-quality information. Strong and compelling findings were used to support the recommendations for the needed change in clinical practice. The translation is the final phase of the PET process. During this phase, it is required to identify the recommendations, create, and implement a plan of action, evaluate the outcomes, report the findings to the key stakeholders, and disseminate the findings. For this evidence-based project a collective effort and the cooperation of the medical staff members was necessary for the implementation of the 12-week project. During the 12-week period, the office was introduced to a new format of scheduling telehealth patients into the provider’s day-to-day appointments. The required information was gathered from the pre- and post-intervention. A final evaluation of the patient outcomes was reviewed and presented to the key stakeholders.

This JHNEBP model was found to be very helpful because of its step-by-step tool to simplify this EBP project for the PL. Each step was thoroughly explained and its purpose of why
each phase was important for the success of the EBP project. It is widely used among clinicians for its user-friendly tools and powerful problem-solving approach to clinical decision-making throughout the EBP process (Dang & Dearholt, 2017). It was designed particularly for the practicing nurse’s needs while using the three step PET process: practice question, evidence, and translation (Dang & Dearholt, 2017). The main goal of the JHNEBP model is to encourage query, discovery, and practice change, to incorporate best practice for patient care (Dang & Dearholt, 2017). A weakness of this model was that it was very time-consuming. The specified and difficult framework posed as an issue with amount of time that was allotted for this EBP project.

**Recommendations for the Future**

The findings from the literature support the need for telehealth, which was rapidly augmented during the recent COVID-19 pandemic. Thus, making in-person visits less accessible and less safe due to risk for exposure and forcing a rapid inclusion of live video and audio visits (Crossen et al, 2022). Outcomes from this EBP project demonstrated that telehealth was not only highly effective, but it also proved to be favored among the patients that participated and was found to offer more patient-centered care. There is more evidence that is emerging in the current literature that further supports the efficacy and the need for telehealth medicine regarding the treatment of T2DM, and other co-morbid diseases (Crossen et al, 2022; Ju, 2020; Mabeza et al, 2022). However, more studies are needed to evaluate if the same data is present over a 1-year period. Many patients have returned to in-person visits due to the lift in the shelter-in place orders and because of the vaccine, there is a significant decrease in fear of contracting COVID-19.

**Research**
The main purpose of this EBP project was to evaluate if telehealth was effective in the treatment of T2DM. Each patient’s initial HgbA1c was collected during their face-to-face visit and the second was collected 12-weeks from the initial measurement. The data collected from this evidence-based project aligns with the current literature. However, several findings indicate that there is more research needed to evaluate if telehealth is as effective over a 1-year period (Crossen et al., 2022; Lee et al., 2019; Mabeza et al., 2022; McLendon, 2017; Pamaiahgari, 2018; Robson & Hosseinzadeh, 2021). One piece of evidence states that since the ease of the COVID-19 restrictions the numbers of telehealth in primary care have started to decline.

One research suggests that a comparative analysis with a face-to-face group could provide more supporting evidence that reflects effective treatment and management of chronic illness, such as T2DM. If there was more time allotted for this EBP project, a more definitive projection would likely solidify the current findings. Various literature supports the need to evaluate if the patient’s overall compliance and HgbA1c continue to improve over time. Telehealth modality quickly became widely accepted during the pandemic and was proven to be effective over a short period of time. However, more research is needed to measure the effectiveness over a 1-year period.

**Education**

Since the pandemic it has been necessary for many in healthcare to incorporate telehealth into practice to avoid treatment gaps and increase patient access. Many undergraduate programs are starting to incorporate a basic introduction to telehealth and different methods of telecommunication delivery. The current literature states that undergraduate-level nurses should have more exposure to telehealth to be better prepared for when the need presents itself (Eckhoff, Guido-Sanz, & Anderson, 2022). It is further recommended that undergraduate nursing students are properly trained in telehealth and its technology to properly treat and manage patients with acute or chronic illnesses, preventative care, and deliver care in a safe, effective manner (Eckhoff et al., 2022).
Many Advanced Practice Nursing (APN) programs across the United States (US) have already incorporated telehealth training into the curriculum (Eckhoff et al., 2022). The APN’s role was forced to evolve due to the recent pandemic. Schools for APNs have been asked to incorporate telehealth technology into the curriculum and develop a competency of its use, standards of practice and any legal issues that are associated with telehealth technology (Eckhoff et al., 2022). Virtual visit simulations should prepare the APN student to obtain an accurate health history and physical, and formulate an accurate diagnosis (Eckhoff et al., 2022; Rutledge & Gustin, 2021). New nurses were thrust into incorporating telehealth during the pandemic without any proper training prior to the pandemic. The pandemic created a spotlight on how to incorporate technology into clinical practice which included bedside nursing to home health (Rutledge & Gustin, 2021). Telehealth curriculum is slowly being incorporated into many undergraduate and graduate nursing programs, however according to the literature, more training is needed (Eckhoff et al., 2022).

**Conclusion**

Since the pandemic, healthcare was forced to change which included how health care was delivered to patients. Many nurses and APNs were thrust into the incorporation of telehealth to decrease gaps and disparities in care. There were many challenges and adaptations that forged the change in the management of patients in primary care. Patients with chronic diseases, such as T2DM, chose not to be seen and go without medication for fear of contracting the COVID-19 Virus, which could have increased the risk of mortality (Lee et al., 2019; Mclendon, 2017; Pamaiahgari, 2018; Robson & Hosseinzadeh, 2021). Recent changes to undergraduate and graduate nursing programs have begun to incorporate telehealth technology and this change (Eckhoff et al., 2022; Rutledge & Gustin, 2021). The current recommendations suggest that APNs, especially doctorate prepared APNs, implement telehealth into their practice to improve access to health care and decrease the associated comorbid conditions that are associated with
uncontrolled T2DM, especially in areas where health care is limited and inequalities to the type of healthcare access is extremely limited (ADA, 2022; Eberle & Stichling, 2021).

This EBP project addressed the PICOT question: In patients with diabetes mellitus type 2 who have difficulty with medical visit compliance, will the telehealth platform, compared to patient’s previous visit face-to-face HgbA1c improve future HgbA1c diagnostic marker readings over a 12-week period? The results of this student led project showed that there was statistical significance regarding the incorporation of telehealth to effectively treat and manage patients with T2DM in primary care. However, more research is needed to evaluate the long-term effectiveness of telehealth management in patients with T2DM as well as other comorbid conditions.
REFERENCES

Begin first citation here. Double spaced within and after each entry. Hanging indent (second and subsequent lines are all indented 0.5” (typically one tab).

Keep the hyperlinks within your URLs and DOIs. Do not separate your URLs to try to get them to fit on a line. Allow the computer to do it naturally. Do not end a hyperlink or DOI with a period.


Bellman, S.M. Type 2 diabetes mellitus: Telemedicine. The JBI EBP Database. 2022; JBI-ES-4901-3

C.Evidence Summary. Diabetes management: Using ehealth in a rural or remote setting. The JBI EBP Database. 2018; JBI20211


Elsayed, N. A., Aleppo, G., Aroda, V. R., Bannuru, R. R., Brown, F. M., Bruemmer, D.,


Gupta, U., Gupta, Y., Jose, D., Mani, K., Jyotsna, V. P., Sharma, G., & Tandon, N. (2020).


interventions to support self-management of long-term conditions: A systematic Metareview of diabetes, heart failure, asthma, chronic obstructive pulmonary disease, and cancer. *Journal of Medical Internet Research, 19*(5), e172. [https://doi.org/10.2196/jmir.6688](https://doi.org/10.2196/jmir.6688)


Melnyk, B. M., & Fineout-Overholt, E. (2019). Evidence-based practice in nursing and

Implications of remote monitoring technology in optimizing traditional self-monitoring of blood glucose in adults with T2DM in primary care. https://doi.org/10.21203/rs.3.rs-672031/v1


Rutledge, C. M., Gustin, T., (January 31, 2021) "Preparing nurses for roles in telehealth: Now is the time!" OJIN: The Online Journal of Issues in Nursing Vol. 26, No. 1, Manuscript 3.


Standards of medical care in diabetes—2022 abridged for primary care providers.


Telemedicine-assisted self-management program for type 2 diabetes patients. *Diabetes Technology & Therapeutics, 21*(9), 514-521. [https://doi.org/10.1089/dia.2019.0056](https://doi.org/10.1089/dia.2019.0056)
BIOGRAPHICAL MATERIAL

Melissa Toulios received her Bachelor of Science in Nursing from Saint Xavier University in 2004. Following graduation, she began working in the Adult Surgical Heart Unit at Advocate Christ Hospital in Oak Lawn, Illinois. There she developed critical skills that inspired her growth on the clinical side of advanced nursing practice. Prior to working at Advocate Christ Hospital, she worked as a medical assistant at a small privately owned family practice. In June of 2006, she married her husband, Bill. She returned to Saint Xavier University to complete her Master of Science in Nursing, which was achieved in 2010. Following graduation, she received her family nurse practitioner certification through the American Academy of Nurse Practitioners. During her time receiving her graduate degree she had given birth to her first child, Dino, who was the driving force that led her to complete the vigorous program. She applied for and was granted staffing privileges at MacNeal Memorial Hospital. Mrs. Toulios was a pioneer, being the first nurse practitioner to make hospital rounds and manage in-patient care. This has made it easier for current and future NPs to practice within the full scope of practice. There she continues to work closely with hospital administration and promotes the importance of the Nurse Practitioner’s role in a hospital setting, its benefits to patients and the community that they serve. Her practice began to flourish and welcomed two more children during her career, Fotini and Athena. Mrs. Toulios worked as an adjunct faculty member at Lewis University in Romeoville but left to fulfill her dream and attain her Doctor of Nursing Practice. She is a proud member of the American Nurses Association, American Academy of Nurse Practitioners, the American Organization for Nursing Leadership, and the Illinois Obesity Society. Her Aesthetics certification was received in June of 2021. In May of 2022, Mrs. Toulios was granted Full-Practice Authority. She and her sister, Tia, have co-ownership of Aegean Wellness and Aesthetics and are looking forward to growing their small independent practice once Mrs. Toulios graduates from Valparaiso University and plans on returning to teaching nursing.
Recently Melissa was invited to present her DNP project at the Diabetes UK Professional Conference 2023 in Liverpool.
ACRONYM LIST

ADA: American Diabetes Association
ANA: American Nurses Association
APN: Advanced Practice Nurse
CDC: Centers for Disease Control
CINAHL: Cumulative Index of Nursing and Allied Health Literature
CITI: Collaborative Institutional Training Initiative
CPG: Clinical Practice Guidelines
DM2: Diabetes Mellitus Type 2
DNP: Doctor of Nursing Practice
DPP: Diabetes Prevention Program
EBP: Evidence Based Project
EMR: Electronic Medical Record
HgbA1c: hemoglobin A1c
HCPCS: Healthcare Common Procedure Coding System
GLP-1: Glucagon-Like Peptide-1
JHEBPM: John Hopkins Evidence-Based Practice Model
NP: Nurse Practitioner
PET: Practice, Evidence, and Translation
PL: Project Leader
RCT: Randomized-Controlled Trials
SGLT2: Sodium-Glucose Co-Transporter 2
SR: Systematic Reviews
TDM2: Type 2 Diabetes Mellitus
TRIP: Turning Research into Practice
APPENDIX A

John Hopkins Nursing Evidence-Based Practice Model Permission

JOHNS HOPKINS EBP MODEL AND TOOLS- PERMISSION

Thank you for your submission.
We are happy to give you permission to use the Johns Hopkins Evidence-Based Practice model and tools in adherence of our legal terms noted below. No further permission for use is necessary.

You may not modify the model or the tools without written approval from Johns Hopkins.
All reference to source terms should include: “©The Johns Hopkins Hospital/The Johns Hopkins University.”

The tools may not be used for commercial purposes without special permission.

If interested in commercial use or discussing changes to the tool, please email jhn@jhmi.edu.

Downloads:
2022 JH EBP Tools- Printable Version
2022 JH EBP Tools- Electronic Version

Would you like to join us? Group rates available, email info@jhmi.edu to inquire.

EBP Boot Camp:
EBP Boot Camp. We are offering a 5-day intensive Boot Camp where you will learn and master the entire EBP process from beginning to end. Take advantage of our retreat-type setting to focus on your project, collaborate with peers, and get the expertise and assistance from our faculty.
Appendix B

PET Process

### EBP Work Plan

**Initial EBP question:** In patients with diabetes mellitus type 2 who have difficulty with medical visit compliance (P), will the telehealth platform (I), compared to patient’s previous visit face-to-face HgbA1c (C) improve future HgbA1c diagnostic marker readings (O) over a 12-week period (T)?

**EBP team leader(s):** Melissa N. Toulis, MSN, FNP-C  
**EBP team members:** Dr. Mackenzie Shireman, DNP  
**Goal completion date:** 01/24/2023

<table>
<thead>
<tr>
<th>Steps</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recruit interprofessional team</td>
<td>8-22</td>
</tr>
<tr>
<td>2. Determine responsibility for project leadership</td>
<td>9-22</td>
</tr>
<tr>
<td>3. Schedule team meetings</td>
<td>8-22</td>
</tr>
<tr>
<td>4. Clarify &amp; describe the problem (App. B)</td>
<td>8-22</td>
</tr>
<tr>
<td>5. Develop &amp; refine the EBP question (App. B)</td>
<td>09-22</td>
</tr>
<tr>
<td>6. Determine the need for an EBP project</td>
<td>8-22</td>
</tr>
<tr>
<td>7. Identify stakeholders (App. C)</td>
<td>8-22</td>
</tr>
<tr>
<td>8. Conduct internal &amp; external search for evidence</td>
<td>8-22</td>
</tr>
<tr>
<td>9. Appraise the level &amp; quality of each piece of evidence (Apps. E/P)</td>
<td>9-22</td>
</tr>
<tr>
<td>10. Summarize the individual evidence (App. G)</td>
<td>10-22</td>
</tr>
<tr>
<td>12. Develop best evidence recommendations (App. H)</td>
<td>01-23</td>
</tr>
<tr>
<td>13. Identify practice setting-specific recommendations (App. I)</td>
<td>01-23</td>
</tr>
<tr>
<td>14. Create action plan (App. I)</td>
<td>07-23</td>
</tr>
<tr>
<td>15. Secure support &amp; resources to implement action plan</td>
<td>02-23</td>
</tr>
<tr>
<td>16. Implement action plan</td>
<td>09-22</td>
</tr>
<tr>
<td>17. If change is implemented, evaluate outcomes to determine if improvements have been made</td>
<td>01-23</td>
</tr>
<tr>
<td>18. Report results to stakeholders (App. C)</td>
<td>03-23</td>
</tr>
<tr>
<td>19. Identify next steps</td>
<td>02-23</td>
</tr>
<tr>
<td>20. Disseminate findings (App. J)</td>
<td>04-23</td>
</tr>
</tbody>
</table>
Appendix C

Patient Education Packets

TYPE 2 DIABETES
comorbidities and management

Diabetes affects 1 in 11 people (20-77 years), which equates to 463 million people worldwide. This is expected to rise by 51%, to 700 million by 2045 due to:
- Rising levels of obesity
- Unhealthy diets
- Widespread physical inactivity

Many factors can increase the risk of developing type 2 diabetes, including:
- Unhealthy diet, inactive lifestyle, obesity and aging.

Type 2 diabetes can also impact mental health. 40% of people with type 2 diabetes suffer with a negative impact on psychological wellbeing after diagnosis.

Diabetes is associated with various medical complications such as cardiovascular disease and kidney disease.

People with type 2 diabetes are up to four times more likely to develop heart disease than people without diabetes.

Approximately 50% of people with type 2 diabetes have some level of kidney disease.

Despite advances in patient care, a substantial number of people with type 2 diabetes still develop diabetes-related complications. New therapeutic options may therefore still be needed.

If you or your loved one is experiencing symptoms of type 2 diabetes or is concerned about the interconnectivity to other medical conditions, speak to your doctor.

References:

Artwork: 2C:0001 - Final - Date of preparation: July 2015 ©2015 Boehringer Ingelheim International GmbH. All rights reserved.
HEALTHY PORTIONS

WHAT IS A PORTION, ANYWAY?
A portion is the amount of food that you actually eat. It’s not necessarily the same as the serving size found on the food label. For example, a 20 oz bottle of soda might say on its Nutrition Facts label that it contains 25 servings. But if you drink the whole bottle, your portion was 25 servings.

THE INCREDIBLE EXPANDING PORTION
The portion sizes that people think of as normal are getting bigger and bigger. It’s easy to overeat with what healthy portion sizes are. By using the hand method shown here, you can get a better grasp on healthy portion sizes.

A HANDY GUIDE TO PORTION SIZES
Stay on track with your portions by using this quick guide to estimate portion sizes and servings. Practice can help you choose portion sizes that provide the amount of calories you need. This can help keep your blood sugar in range.

PROTEIN: An open palm, including fingers and thumb, is about 3 ounces of cooked chicken. This should be the size of your protein portion.

VEGETABLES AND STARCHES: A fist is about the size of 1 cup or 30 grams of food. This is a good portion of cereal, bread, or starchy vegetables such as potatoes or corn.

FATS: The thumb is about 1 tablespoon. This is a good portion of regular salad dressing or reduced-fat mayonnaise. The thumb tip is about 1 teaspoon, which you can use as a portion of margarine, mayonnaise, or olive oil and salad dressings.

YOUR NEXT MOVE
Practice using the hand method for your next meal. Compare your portion sizes to the portions shown above.

To get more tips on portion control and serving sizes, go to www.lillydiabetes.com.

DAILY DIABETES MEAL PLANNING GUIDE

DISTANCE BASING AT A GLANCE:
• Balance your plates to manage your weight.
• Balance your diet to include new foods, such as fruits, vegetables, whole grains, low-fat dairy, and lean protein, and healthy fats.
• Select one color of pasta, grain, or added sugars, whole grains, unsaturated fats, and low-fat dairy products, and low-sodium, low-fat foods.
• Use your kidneys to ensure your blood glucose is maintained in the target range, which depends on your diabetes type and treatment (whether you take insulin or medication). Your diabetes treatment plan may vary depending on your needs and treatment plan. You may need to take care of your blood glucose levels to prevent complications.
• Consult your health care provider regularly to ensure your plan is working for you.
• Consult your health care provider regularly to ensure you are using the right tools and strategies for your lifestyle.
• Consult your health care provider regularly to ensure you are using the right tools and strategies for your lifestyle.
• Consult your health care provider regularly to ensure you are using the right tools and strategies for your lifestyle.
Appendix D

This is to certify that:

**Melissa Toulios**

Has completed the following CITI Program course:

- **Group 1: Social Behavioral Educational Researchers**
  (Curriculum Group)
- **Group 1: Social Behavioral Educational Researchers**
  (Course Learner Group)
  1. Basic Course
  (Stage)

Under requirements set by:

**Valparaiso University**

Verify at: [www.citiprogram.org/verify/?wbf92642b-e752-47a0-a085-72fcb618103e-41768847](http://www.citiprogram.org/verify/?wbf92642b-e752-47a0-a085-72fcb618103e-41768847)